The Electrical Industry's Weekly Magazine

September 3, 1956

Electrical World

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A McGraw-Hill Publication

COMMUNITY

RECREATION AND TRAVEL

Area Development— The Fight For New Business

INDUSTRIAL

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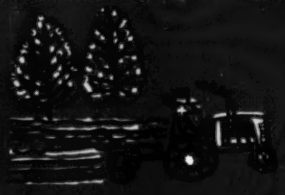

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Unit construction means you remove only the bolts from cover and control for untanking. This simplified process can save 75% of service costs.

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ELECTRICAL WORLD

Published weekly by McGraw-Hill Publishing Co., Inc., Executive, Editorial and Advertising Offices: **McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y.** Publication Office, 99-129 North Broadway, Albany 1, N. Y.

Donald C. McGraw, President; Paul Montgomery, Executive Vice-President; Joseph A. Gerardi, Executive Vice President and Treasurer; John J. Cooke, Secretary; Nelson Bond, Executive Vice President, Publications Division; Ralph B. Smith, Vice President and Editorial Director; Joseph H. Allen, Vice President and Director of Advertising Sales; J. E. Blackburn, Jr., Vice President and Circulation Director.

Subscriptions: Address correspondence to Electrical World—Subscription Service, 99-129 North Broadway, Albany 1, N. Y. or 330 W. 42nd St., New York 36, N. Y. Allow one month for change of address.

Subscriptions are solicited only from executive, supervisory, and engineering personnel in electric utilities, manufacturing companies, and related fields. Position and company connection must be indicated on subscription orders.

Single copies 35¢. For the United States and possessions and Canada, $6 a year, $9 for two years, $12 for three years. Other Western Hemisphere, and the Philippines, $15 for one year, $25 for two years, $30 for three years. All other countries, $25 for one year, $40 for two years, $50 for three years. Entered as second-class matter at the Post Office at Albany, N. Y. Printed in USA. Copyright 1956 by McGraw-Hill Publishing Company, Inc. Permission required to reproduce any of contents.

Electrical World

Published for 82 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Vol. 146, No. 10 **September 3, 1956**

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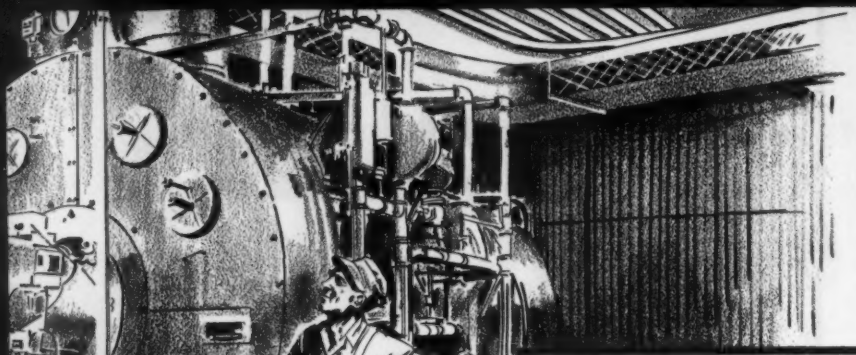
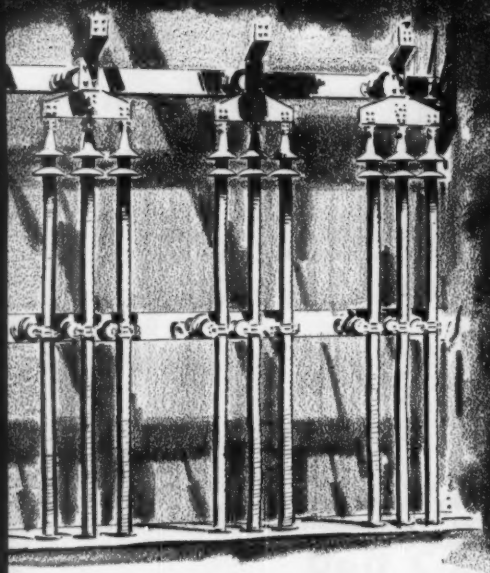


1. in hot places

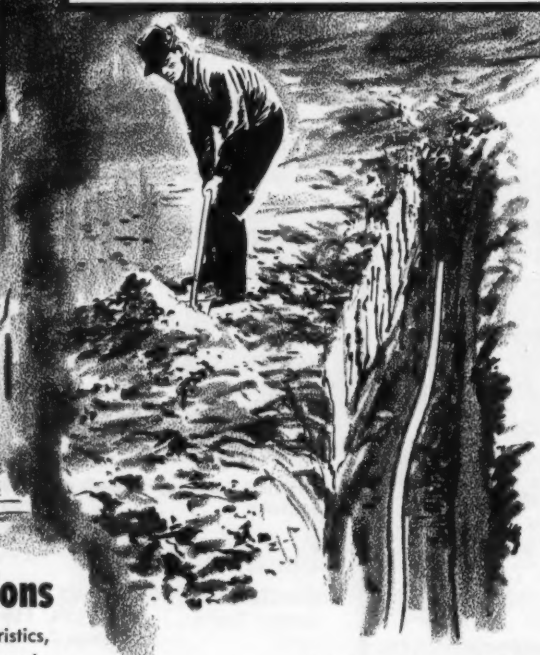
Exceptionally resistant to the deteriorating effects of heat, Okonite Keystone insulation is designed for operation at copper temperatures up to 85 C. This makes it especially useful in boiler rooms, crowded ducts and other locations where there is a high ambient temperature.

3 spots where KEYSTONE-INSULATED CABLES *pay extra dividends in failure-free operation*



2. high ozone concentrations

Because of its stable chemical characteristics, Okonite Keystone insulation provides an extremely high degree of resistance to ozone and corona cutting. It withstands a longer test period and sharper bends than required by IPCEA and ASTM for ozone-resistant compounds. This assures maximum reliability in high voltage installations where ozone is always present.



3. in moist locations

Keystone-insulated cables may be used anywhere . . . in damp places or even for direct burial. Tests show that Keystone insulation does not absorb appreciable amounts of moisture even when immersed directly in water. Electrical and physical characteristics remain stable regardless of the moisture present in installations.

Send for the complete story as detailed in Bulletin H-463. Here are the results of twelve years of field service and tests, reported with charts and graphs of test results, together with 36 pages of technical data to aid in specifying and installing the proper cable for the job. Write to The Okonite Company, Passaic, N. J.

3652-A

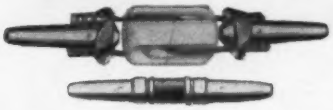
where there's electrical power . . . there's **OKONITE CABLE**

for the largest number of line applications, at the lowest possible cost . . .

Electroline Products

Practical experience designed these Electroline Products; and a practical habit of keeping close tab on costs has established them as first in the field—for top quality and economical performance.

ELECTROLINE SECTIONALIZERS

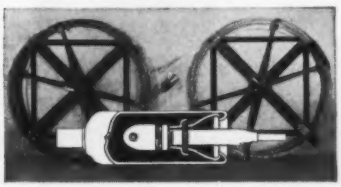


Insulating automatic line splice sectionalizers:

- simplify cutting-in of regulating equipment—disconnecting points, fuses, voltage regulators, series capacitors, etc.
- to provide points to test for trouble
- for sectionalizing networks—to isolate and test area in trouble
- series street lighting—simplifies cutting-in series lamps

Bulletins contain complete information.

DUCT-RODDING EQUIPMENT



Light in weight, feeds easily around bends, easy to handle. Electroline Steel Duct-Rodding Equipment has an extraordinary record for high efficiency at lowest cost. A big money-saver—cuts labor cost, original cost and total investment.

A four-page illustrated brochure gives full information.

AUTOMATIC LINE SPLICES

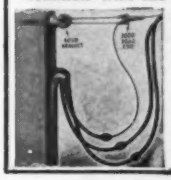
It is well said of these simple, rugged units—"They go on in no time; they hang on for all time." Easy to install—and their mechanical strength exceeds the rated breaking strength of the conductors. Ideal for restoring service.

AUTOMATIC DEAD-ENDS

In a typical "torture" test for strength, gripping and vibration damping features, 100,125,000 recorded vibrations did not develop any sign of failure of conductor in these rugged dependable Dead-Ends. Engineers call it equivalent to 50 years of ordinary service.

Electroline Service-Drop Automatic Dead End. The "3800" Series for holding pre-assembled service cable using a bare neutral conductor as the messenger.

The method of gripping the bare neutral employed by this ELECTROLINE Anchorage eliminates the danger of short circuiting the phase wires so common with the use of concentric cable clamps.



ELECTROLINE Service-Drop Anchor Bracket. The "4000" Series for securely supporting the cable at any angle.

Electroline Company

4121 So. LaSalle St., Chicago 9, Ill. *In Canada:* **POWERLITE DEVICES, LTD., TORONTO**

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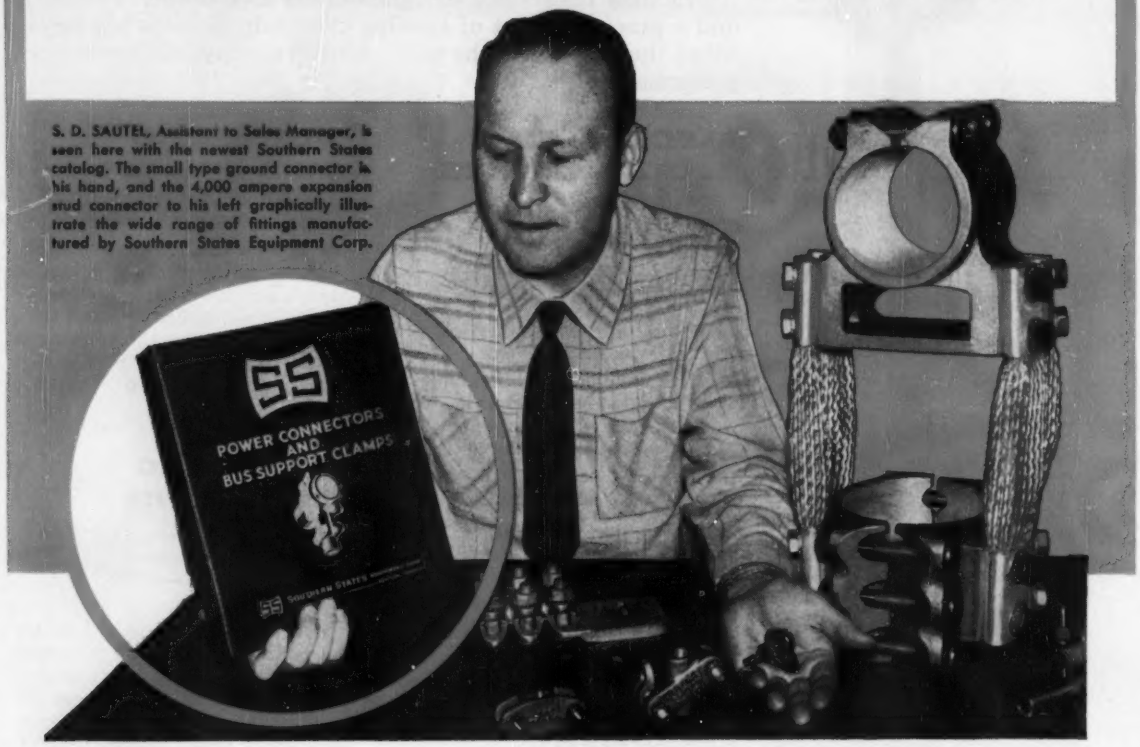
THE POWER CONNECTORS AND BUS SUPPORTS NEEDED FROM GENERATION TO DISTRIBUTION



S. D. SAUTEL, Assistant to Sales Manager, is seen here with the newest Southern States catalog. The small type ground connector in his hand, and the 4,000 ampere expansion stud connector to his left graphically illustrate the wide range of fittings manufactured by Southern States Equipment Corp.

Three years ago Southern States began an extensive program of re-designing and expanding its line of power connectors and bus support clamps. Ears were strengthened and weights increased 40% to 50%.

The result is a line of rugged fittings in a full range of sizes and types. You can choose a suitable Southern States connector for application on your system for practically any requirement . . . from the generating station to the distribution system.

The complete line is included in the new Southern States catalog, which is fully illustrated and indexed to make it easy to find the exact fitting required for any application.

If you have not yet received your copy and could use one, see your Southern States representative or write direct for Catalog No. 526.

SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

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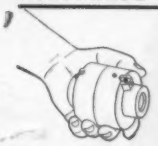


Current transformers provide built-in adaptability for future load growth

When polyphase loads go over 100 amperes—it's time to install Sangamo Type R Current Transformers. Their unique adaptability encourages simple economical installations that eliminate the need for larger self-contained meters which have only limited capacity for still further expansion.

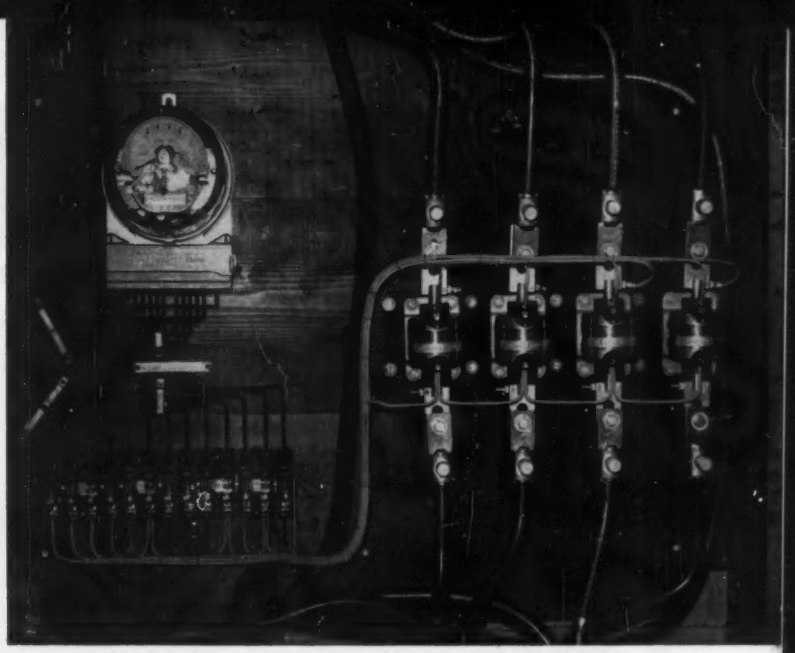
Sangamo Type R Transformers can be used as bar-primary-types or window-types, with or without auxiliary mounting plates, and are light enough to be fully supported by the primary conductor.

Available in 200 and 400 ampere ratings, in eight variations that permit almost any primary arrangement.

Ask your Sangamo Representative, or write us for Bulletins 501 and 150 for detailed information on Type R Transformers and mounting racks.

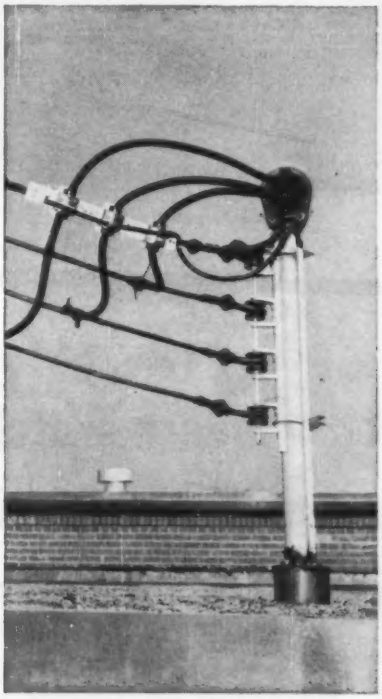
SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

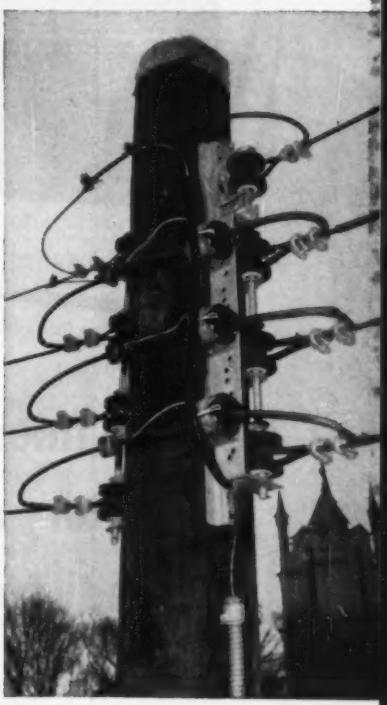


Meter Box Installation measuring 3-wire three-phase and 3-wire single-phase from separate sources on one meter using four Type RF-6A Sangamo Current Transformers.

Three Type RC-6A Current Transformers are supported on a horizontal secondary wire Sangamo Transrack.

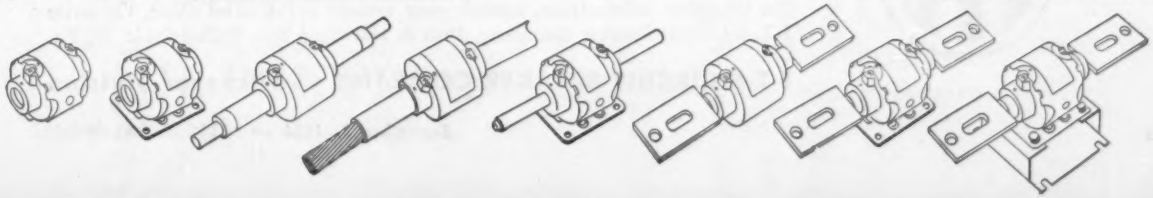


Service entrance mast installation with three Sangamo Type RC-6A Transformers mounted on a Transrack supported by the grounded neutral.



This pole-top installation shows three Sangamo R-6 Current Transformers supported by the secondary rack.

Eight variations of ONE BASIC TRANSFORMER permit the engineer to devise many other economical installations.



SM56-8

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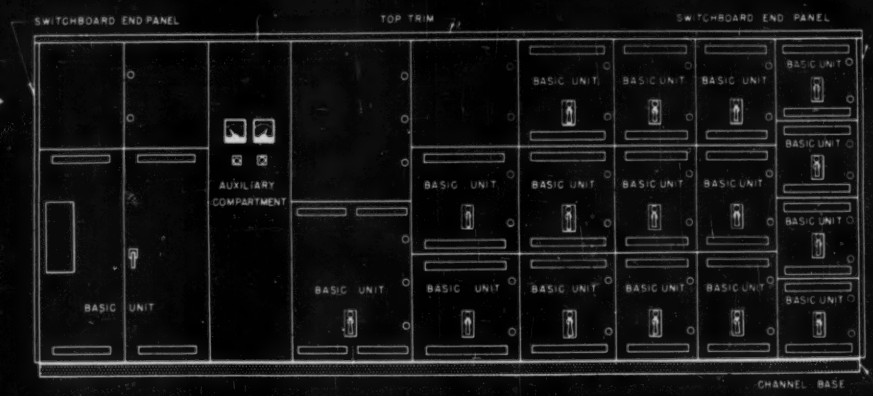

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I-T-E Low Voltage Switchgear provides the optimum in dependability, safety, reduced maintenance costs, and attractive appearance. I-T-E Circuit Breakers have proved their worth in thousands of applications. I-T-E Structures are designed specifically to house and interconnect these time-proved protective devices and auxiliary equipment. When you combine the two, you have the finest of circuit breakers in the finest of structures. And you get the additional advantages of less special engineering, faster delivery, and units custom-made in standard frames to fit your requirements.

For complete information, consult your nearest I-T-E sales office. Or write I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division

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"A hundred twenty five foot long!" Babe, the Blue Ox, dropped the tape off her left horn as Paul Bunyan whistled in amazement. His breath leveled nine young saplings. "Babe, that there's shore some Douglas Fir pole. An' she's jest as smooth an' round an' straight as the legs of a Barbary Coast dancin' gal...Babe, I *know* this'n is a BAXCO Douglas Fir Pole ✻ —without lookin' at the brand."

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DOUGLAS
FIR POLES

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PRESSURE TREATMENTS AVAILABLE: *Creosote, Chemonite, Pentachlorophenol, in accordance with Federal and AWPA specifications.*

J. H. BAXTER & CO. *120 Montgomery Street, San Francisco 4, California*

why the Riley TURBO

. . . why it eliminates flyash disposal
. . . why practically any available fuel
. . . why higher operating economies

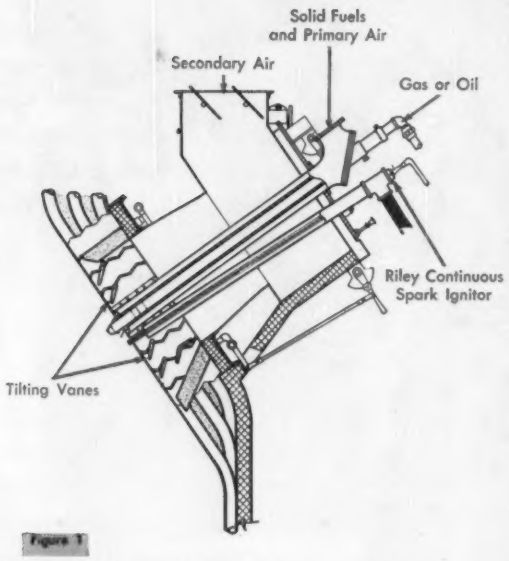

Figure 1

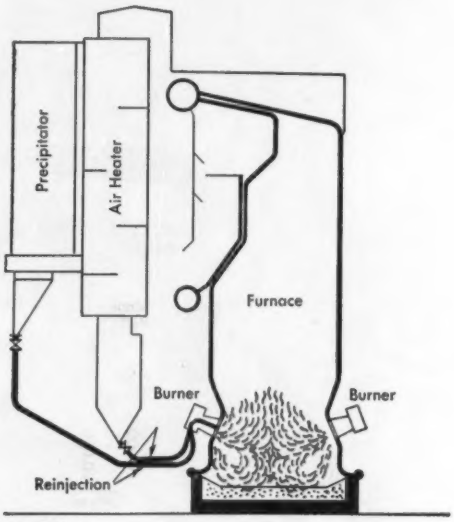

Figure 2

In 1952 a well known eastern chemical company had costly flyash disposal problems at two of its plants. At the time Riley Stoker Corporation had been developing a new type of slag tap furnace design to permit refiring flyash and disposing of it as slag. The idea was accepted. Two Riley boilers with the new furnace were installed . . . one to refire its own flyash, the other to refire its own and that of an adjacent conventional dry bottom unit.

The success of these boilers in eliminating the problem of flyash disposal is a matter of record . . . but the real success story lies in the other outstanding operating characteristics of this type of boiler unit, operating characteristics long sought by engineers and designers.

METHOD OF FIRING

Riley directional flame burners (Fig. 1) inclined slightly downward and located opposite each other in opposite furnace walls (Fig. 2) produce an extremely hot turbulent flame in a restricted, concentrated combustion zone just above the slag pool. Temperatures are high enough to maintain a fluid slag pool even at low loads.

MINIMUM CARBON LOSS

When flyash is refired in the combustion zone practically all the carbon in the ash is burned with residue turning to molten slag. Unburned losses are infinitesimal even in small boilers. Efficiencies of 90% and over are attained and sustained.

LOW FURNACE EXIT GAS TEMPERATURE

A "top secret" of the Riley *Turbo Furnace* is low furnace exit gas temperature produced by bottom-of-furnace firing. Temperature curves in Fig. 3 show *Turbo Furnace* exit gas temperatures at 100 F. to 220 F. below those of a conventional dry bottom unit operating at the same load, having the same capacity and the same amount of water cooling.

FURNACE EXIT TEMPERATURES THE SAME WITH ANY FUEL

The curves in Fig. 3 also indicate that in the *Turbo Furnace* the exit gas temperatures of a variety of fuels are approximately the same. For example, when burning natural gas the furnace bottom contour produces a luminous flame similar in size and appearance to coal flame; result: almost identical furnace exit temperatures.

USES A MULTIPLICITY OF FUELS

Because exit gas temperatures are so nearly identical with any fuel, the *Turbo Furnace* is uniquely suited for high steam temperature installations where uniform steam temperature is wanted while burning coal, lignite, gas, oil, fluid coke, or a combination of these fuels.

NO SOOT AND SLAG BLOWERS NEEDED

With retention of the major portion of ash in the furnace bottom and with resulting low temperatures in

An Advertisement Prepared By

Riley designs, manufactures and erects steam generating units complete with

Worcester New York Philadelphia Buffalo Pittsburgh Cleveland Detroit Chicago Cincinnati Charlotte New Orleans

FURNACE is so versatile

and does away with slag blowers
can be burned in it at any time
are attained and sustained

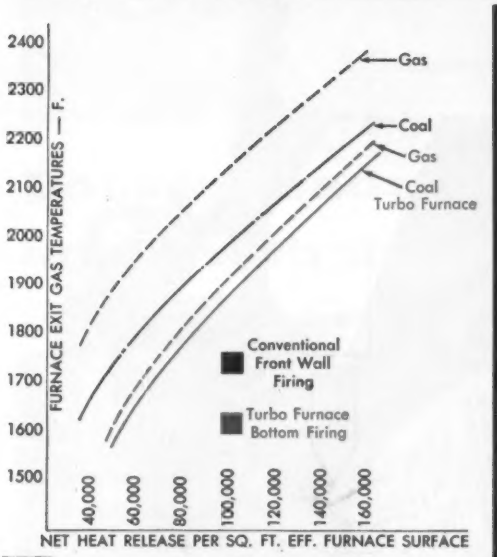

Figure 3

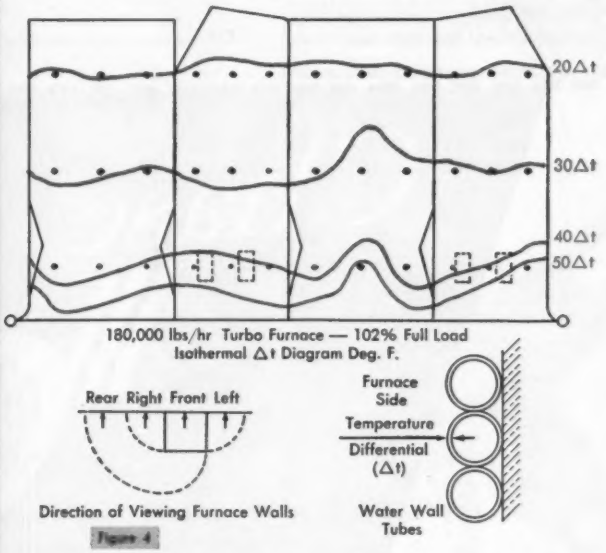

Figure 4

the upper part of the furnace no slagging occurs even with ash of lowest fusion temperatures. Since combustion is restricted to furnace bottom there is no impingement of flame on furnace wall tubes. Only a light dust coating on furnace walls and on convection tube bank occurs. (Fig. 4) illustrates the effect of the cleanliness of the *Turbo Furnace* . . . relatively flat isothermal lines obtained in tests on one of the chemical company's units from readings of centerline thermocouples.

SIMPLIFIED DESIGN AND CONTROL OF SUPERHEATER AND REHEATER

With heat distributed evenly within the furnace and constant temperatures maintained regardless of fuels used the design and control of superheater and reheater for the *Turbo Furnace* unit is greatly simplified.

OPERATION POSSIBLE EVEN WHILE CHANGING TO SOLID FUEL

With pressure parts constant for all fuels a *Turbo Furnace* installed initially to fire gas or oil and designed with a furnace heat release compatible with coal firing can "stay on the line" during installation and hook up of solid fuel handling equipment. No ash hopper has to be added, and Riley directional flame burners are already equipped with coal heads for quick connection to pulverizers.

HIGHER HEAT RELEASES SMALLER SETTINGS

With lower exit gas temperatures the *Turbo Furnace* can be designed for higher heat release rates of both furnace envelope and furnace volume. A smaller furnace without a hopper bottom results in lower overall height.

ONE LEVEL BURNER OPERATION

Burner operation at or near the turbine level has long been desired. The Riley *Turbo Furnace* with all its burners on one level near the bottom of the unit makes one level operation a practical reality.

VERSATILE OPERATING FEATURES REFLECTED IN RECENT PURCHASES

An eastern seaboard public utility will operate three 500,000 lb. per hour *Turbo Furnace* units designed specifically to burn fluid coke plus oil, gas, coal. A Louisiana public utility has ordered a 1,550,000 lb. per hour reheat unit to fire natural gas, but for future conversion to solid fuels. Three 320,000 lb. per hour *Turbo Furnace* units will be installed by a prominent aluminum producer for gas, oil and future pulverized coal. A Texas public utility has purchased an 825,000 lb. per hour reheat unit for natural gas and future pulverized coal or lignite. Another Texas public utility has ordered a 1,260,000 lb. per hour reheat unit for gas firing and future pulverized lignite.

Such acceptance of a relatively new design is recognition of the sound operating advantages involved.

RILEY STOKER CORPORATION *of Worcester, Massachusetts*

heat recovery equipment and fuel burning equipment for all industries and public utilities.

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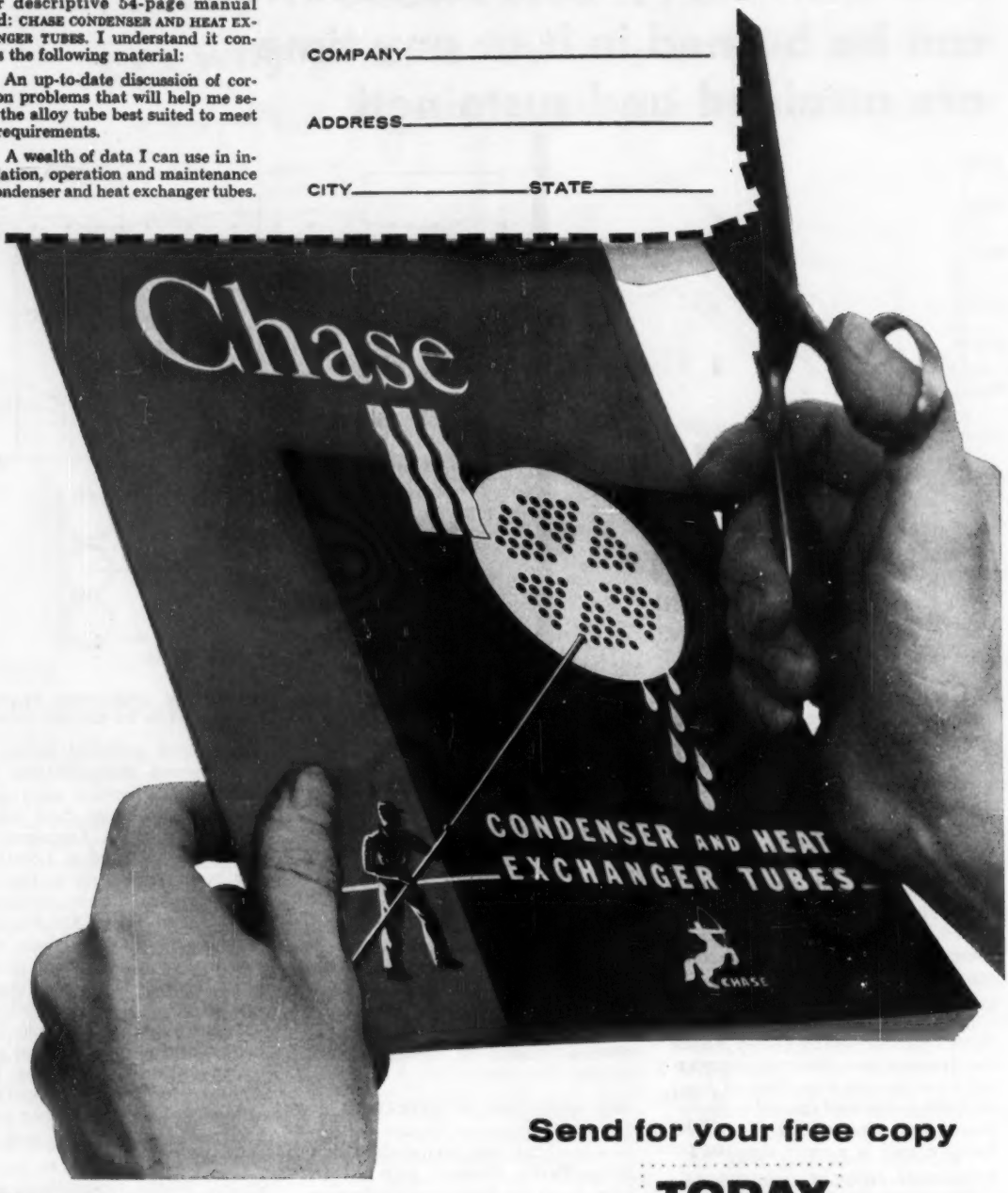

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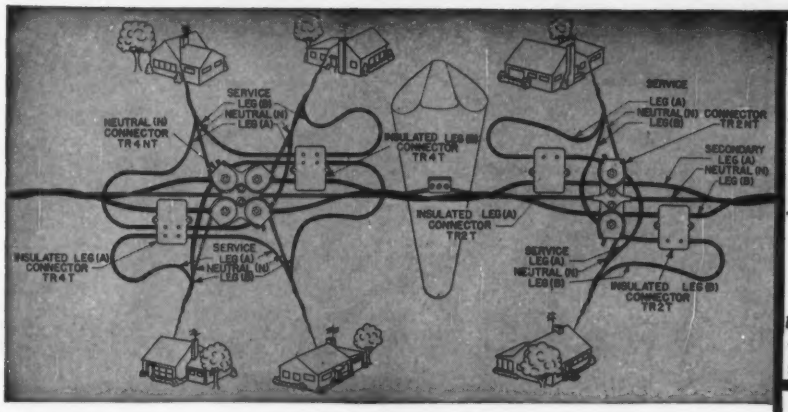
NEUTRAL (N) CONNECTOR TR4NT
SERVICE LEG (B) NEUTRAL (N) LEG (A)
INSULATED LEG (B) CONNECTOR TR4T
SERVICE LEG (A) NEUTRAL (N) CONNECTOR TR2NT LEG (B)
SECONDARY LEG (A) NEUTRAL (N) LEG (B)
INSULATED LEG (A) CONNECTOR TR2T
INSULATED LEG (A) CONNECTOR TR4T
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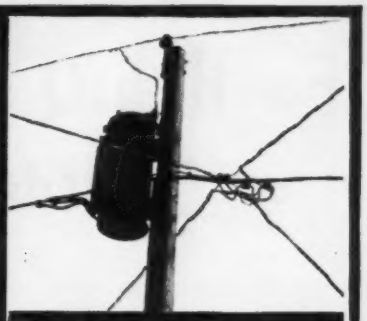
INSULATED LEG (B) CONNECTOR TR2T



A complete 4 service TRIPL-X-TAP unit with type GTC connectors used as secondary feeder taps. †

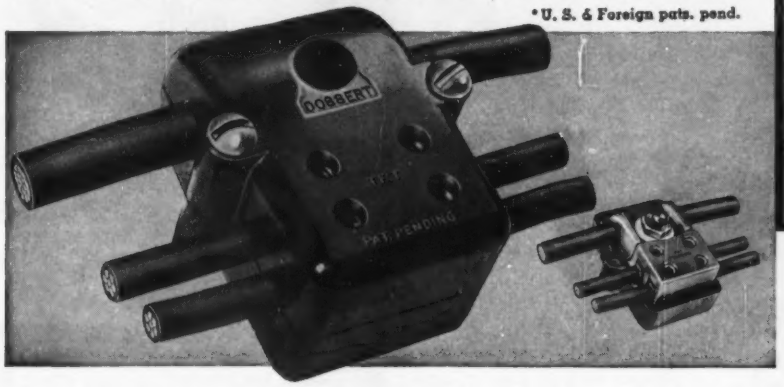
Dossert leads the industry again with the NEW

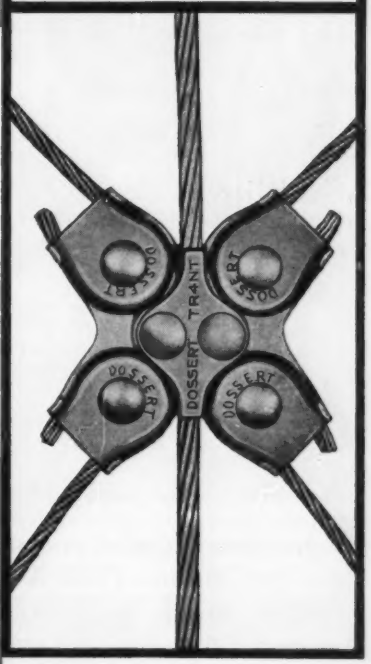
TRIPL-X-TAP*

3-UNIT CONNECTOR

FOR SELF-SUPPORTING SECONDARY AND SERVICE DROP CABLE

*U. S. & Foreign pats. pend.





NEUTRAL CONNECTOR

INSULATED CONNECTOR

Forget about hand-taping . . . about complicated residential hook-ups!

Dossert's new TRIPL-X-TAP 3-Unit Connector—for conductors of copper or aluminum or both—saves labor and installation costs . . . insures the most dependable connections possible.

TRIPL-X-TAP or its components can also be used on open wire systems.

Two Insulated Connectors plus a Neutral Connector comprise the compact, low cost TRIPL-X-TAP "package". No need to remove insulating cover for subsequent connects or disconnects. No secondary spool racks or costly extra hardware. TRIPL-X-TAP installations insure positive electrical joints and through use of supporting neutrals guarantee mechanical permanence. The insulated connector housing is made of high strength, high impact Bakelite composition, affording better insulation and protection.

† Courtesy of Long Island Lighting Co.

50 YEARS OF TECHNICAL KNOW-HOW

Write for details and prices today.

DOSSERT MANUFACTURING CORP.

249 Huron Street, Brooklyn 22, N. Y.

Exclusive Canadian Distributor: W. S. Gorrie & Assoc., Ltd.
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For High Q and Excellent Capacitance Stability

CP

PLASTICON CAPACITORS are made with NATVAR Styroflex®

CP Plasticon Type P Capacitors are available with metal can containers in 22 capacities ranging from 0.1 mfd at 1000 vdc to 25 mfd at 100 vdc; and with tubular "Glass-mike" containers in 22 capacities from .001 mfd at 1000 vdc to 1.0 mfd at 100 vdc.

Capacitors designed and manufactured by Condenser Products Co., Division of New Haven Clock & Watch Co. are extensively used in calculators, computers, integrating circuits, electronic controls, sawtooth oscillators, and other equipment where stability and low dielectric loss are important.

Natvar Styroflex film is used as the dielectric because it has all of the outstanding properties of polystyrene, plus complete flexibility due to bi-axial orientation during the manufacturing process.

If you need an insulating material with the desirable characteristics of polystyrene—plus flexibility, it will pay you to investigate Natvar Styroflex. Ask for new data sheet ST-1, just off the press.

Natvar

Natvar Products

- Varnished cambric—cloth and tape
- Varnished canvas and duck
- Varnished silk and special rayon
- Varnished—Silicone coated Fiberglas
- Varnished papers—rope and kraft
- Slot cell combinations, Aboglas®
- Isoglas® sheet, tape, tubing and sleeving
- Vinyl coated—varnished—lacquered tubing and sleeving
- Extruded vinyl tubing and tape
- Styroflex® flexible polystyrene tape
- Extruded identification markers

Ask for Catalog No. 23

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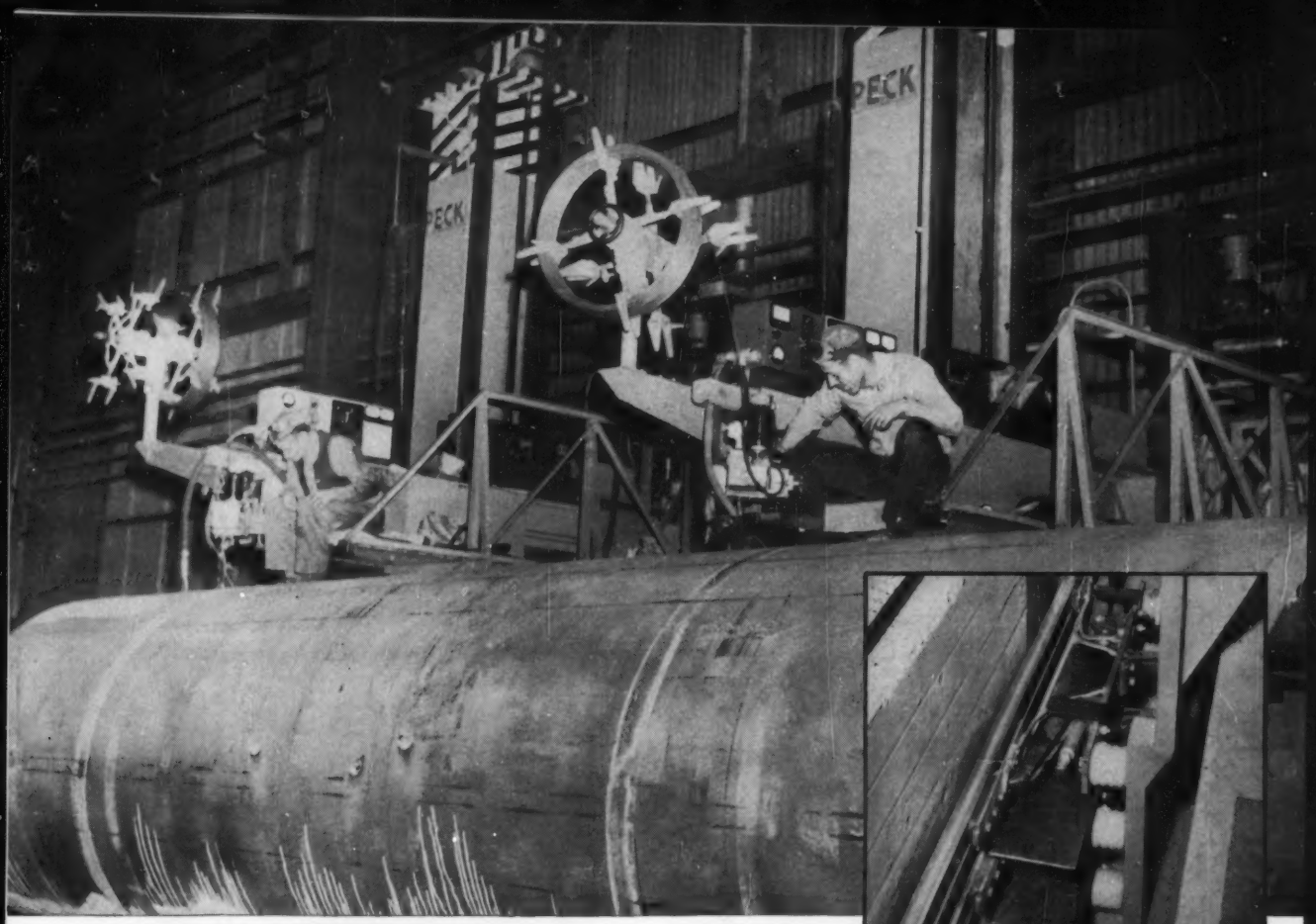
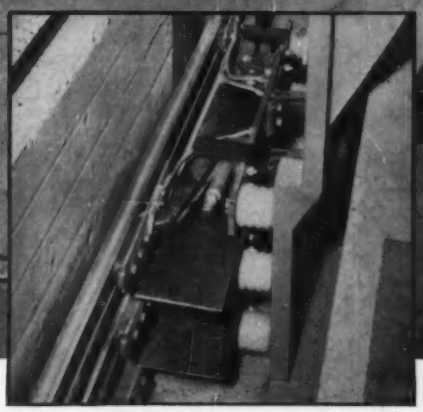


TANDEM WELDING HEADS in operation on heavy pressure vessel at Foster Wheeler Corporation.



VERTICALLY STACKED conductor rails with collectors running at right angles. This system operates at 675 amps. 440 volts.

KEYSTONE

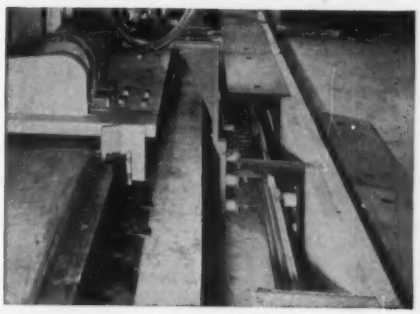
Clears the Deck for Action

Integrated Aluminum Conductor System Powers Automatic Welders Safely, Efficiently

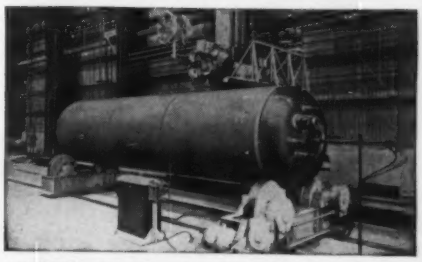
FOSTER WHEELER'S streamlined welding equipment gets much of its efficiency from the KEYSTONE Aluminum Conductor System that powers it. Hazardous cables are eliminated; this promotes safety and prevents interference which might cause hesitation or vibration—and thus an imperfect weld on the pressure vessel.

Welding generators may be completely mobile (as in this case) or stationary. Full welding current can be conducted where needed; conductor lengths have been installed up to 360 ft., can be longer. There's no limit as to length of rails or amperage handled with KEYSTONE Aluminum Conductor Systems.

IMPORTANT NOTE: This application is only one of many in all types of industries. It may suggest a power distribution method in your plant. Write for "Case Histories" on Keystone Aluminum Conductor Systems."



RECESSED POWER source with safety plates removed to show side mounted aluminum conductors and collectors.



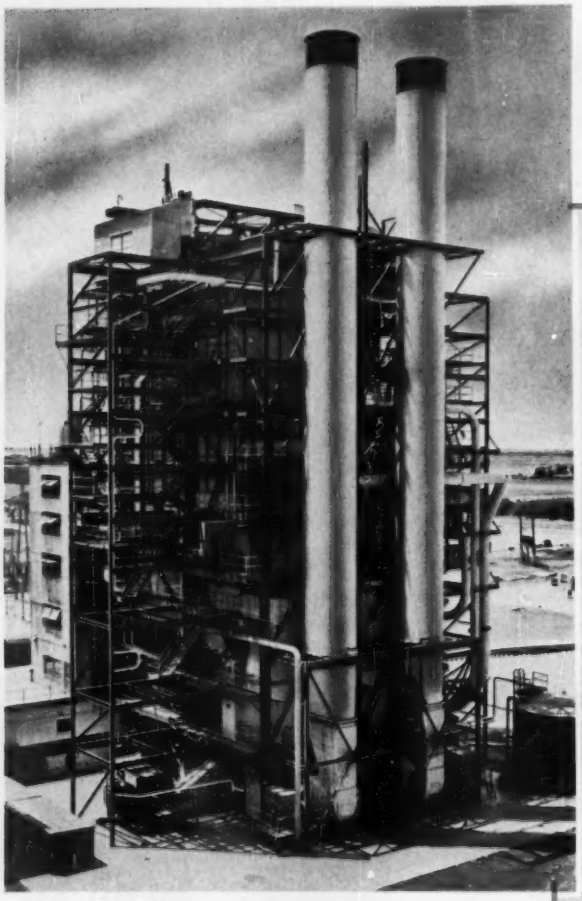
ROTATING CRADLE and moving welder permits horizontal and circular welding. Behind cradle is KEYSTONE Aluminum Conductor System.

KEYSTONE **ELECTRIC SERVICE MANUFACTURING CO.**

Philadelphia 32, Pennsylvania

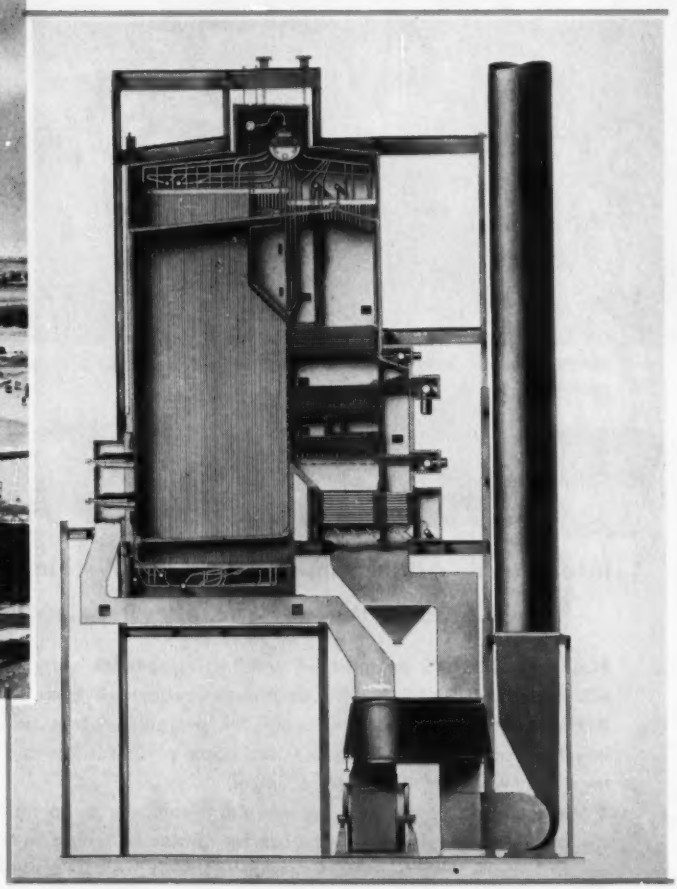
Kansas Gas and Electric puts third*
FW steam generator "on stream" to help...

MEET GROWING DEMAND



Foster Wheeler steam generator, unit no. 3, at the Murray Gill Station of the Kansas Gas and Electric Co. just southwest of Wichita, Kansas. A Foster Wheeler 65,000 sq ft surface condenser of the double-flow type serves the 115,000 kw turbine.

* A fourth FW steam generator, of 800,000 lb per hr capacity is now on order for the Murray Gill Station.



Cross-section of the reheat unit shows arrangement of furnace with space provided for possible future conversion to coal firing.

FOSTER WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.

ON MURRAY GILL STATION

Of outdoor design, this 800,000 lb per hr Foster Wheeler reheat steam generator supplements two other FW units of 425,000 and 625,000 lb per hr capacity serving this modern central station.

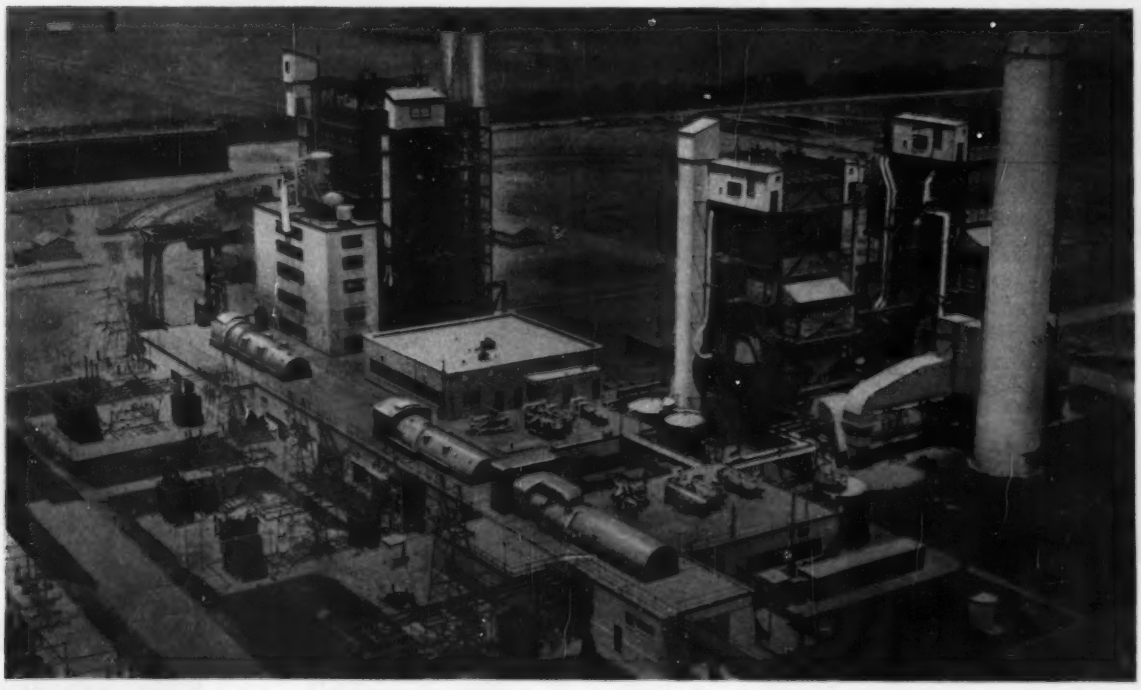
CUSTOMERS of Kansas Gas and Electric Company are consuming more and more electric power. The greater use of electric appliances in the home, increased commercial business, enlarged industrial production — all are resulting in an ever-growing demand on the company's facilities.

And at the Murray Gill Station, the company's newest and most efficient operation, with a total generating capability of 240,000 kw, three Foster Wheeler steam generators are now helping meet this upward trend.

The third FW unit to be installed at Murray Gill went into service in April of 1956 — 20 months after placing of contract. It has a capacity of 800,000 lb steam per hr with corresponding reheater flow of 692,000 lb per hr and steam outlet conditions of 1005 F/1005 F and 1925 psig at the superheater outlet.

Repeat orders like this represent a positive expression of confidence in Foster Wheeler steam plant equipment. With more than fifty years of experience in steam generation — and the finest modern manufacturing facilities in three large plants — Foster Wheeler welcomes the opportunity to quote on your requirements. *Foster Wheeler Corporation, 165 Broadway, New York 6, N.Y.*

Aerial view of Murray Gill Station of KG&E, showing outdoor-type reheat steam generator at left and FW dual circulation units at right.



S&C Positect

gives

1 HIGHEST INTERRUPTING CAPACITY
2 FULL LOAD SWITCHING
3 SAFETY

These are the reasons so many large utilities—after exhaustive testing—have "standardized" on the Positect.

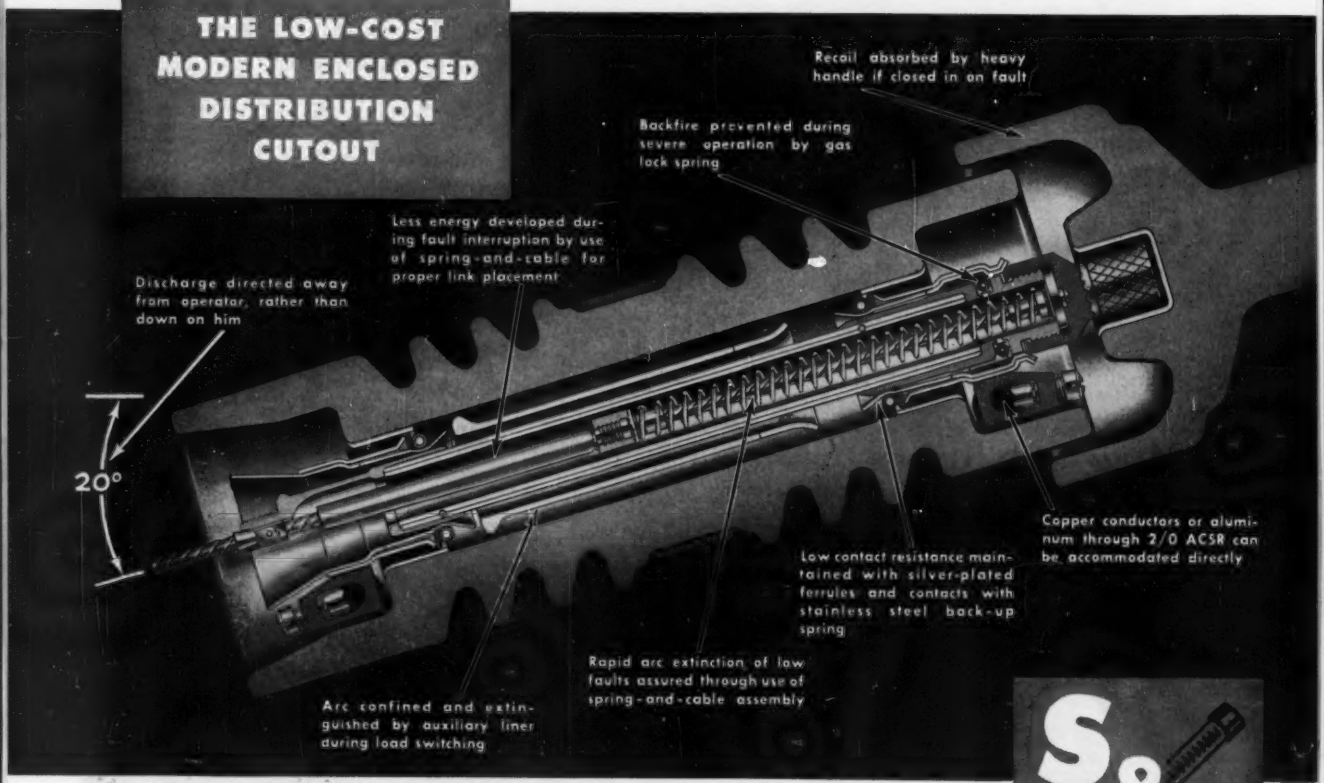
The high interrupting capacities—10,000 and 12,000 amperes asymmetrical for the 50 and 100 ampere sizes, respectively—are backed up by 14,000 and 16,000 ampere one-shot ratings, matching the high faults on today's distribution feeders.

Full load switching—200 amperes of load current, and associated magnetizing and charging current—is positive and without external arcing. And—best of all—there's built-in safety for the operator. Hook stick operation is unnecessary.

For details on the many advantages of "standardizing" on the Positect, write for Catalog Sec. 520 . . . we will gladly send one.

Load switching is accomplished by removal and insertion of bayonet.

THE LOW-COST MODERN ENCLOSED DISTRIBUTION CUTOUT


Recoil absorbed by heavy handle if closed in on fault
Backfire prevented during severe operation by gas lock spring
Less energy developed during fault interruption by use of spring-and-cable for proper link placement
Discharge directed away from operator, rather than down on him
20°
Copper conductors or aluminum through 2/0 ACSR can be accommodated directly
Low contact resistance maintained with silver-plated ferrules and contacts with stainless steel back-up spring
Rapid arc extinction of low faults assured through use of spring-and-cable assembly
Arc confined and extinguished by auxiliary liner during load switching

Specialists in High-Voltage Circuit Interruption since 1910

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POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

S&C

ELECTRICAL BUSINESS OUTLOOK

Electrical World
SEPTEMBER 3, 1956

Electric utility costs will jump $20 to $25 million next year because of higher price tags on just one item. That's how much more it will cost the industry to buy a year's supply of pole type distribution transformers after last week's price hikes on these units. If power transformers follow along you can tack on another $12 to $15 million. There may be some lag in raising prices on power units though, since they were boosted an average of 10% last April.

• • •

It now looks as though the trend to higher prices is going to get a push from an unexpected source in the next couple of months.

The cost of living index is on the way up. Its been on the rise since May when it matched the previous record of 115.4% of the 1947-49 average. In July, according to the Bureau of Labor Statistics, the index set a new record of 117%—an increase of better than 2% since last July and a jump of 1.4% over May's high. You have to figure this in when you take a look at future costs. It means . . .

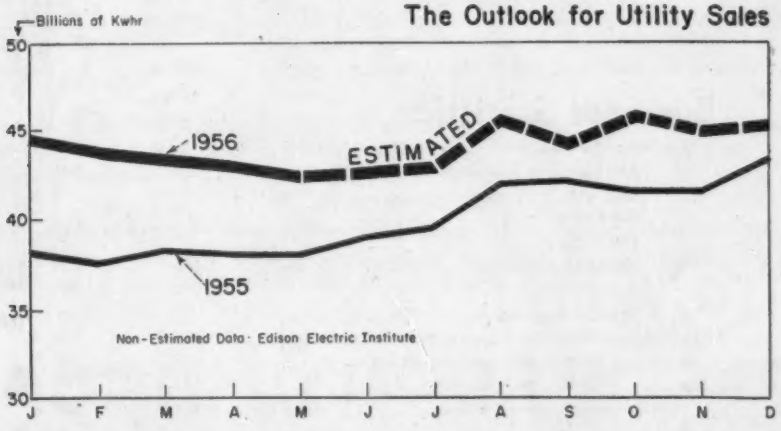
Labor costs are going up. An increase in the index automatically boosts wages for better than 1½ million production workers anywhere from 3 to 5¢ an hour. And don't forget—the July index isn't reflecting the steel settlement which is also bound to push the index up. So far the increase has come from higher food prices. You can't count on these dropping very much—especially not in a presidential election year.

Debt financing will continue to be expensive—at least through the end of 1956 and probably well into 1957. It's still the old story of supply and demand. And the way it looks now, demand will stay high in coming months with industry set to continue its record expansion programs. You get an idea how expensive financing will be for utilities if you consider the cost of a recent bond issue by Consumers Power Co. Consumers sold an issue of 4%, AAA rated bonds to the public on a 3.97% yield—the highest in 20 years.

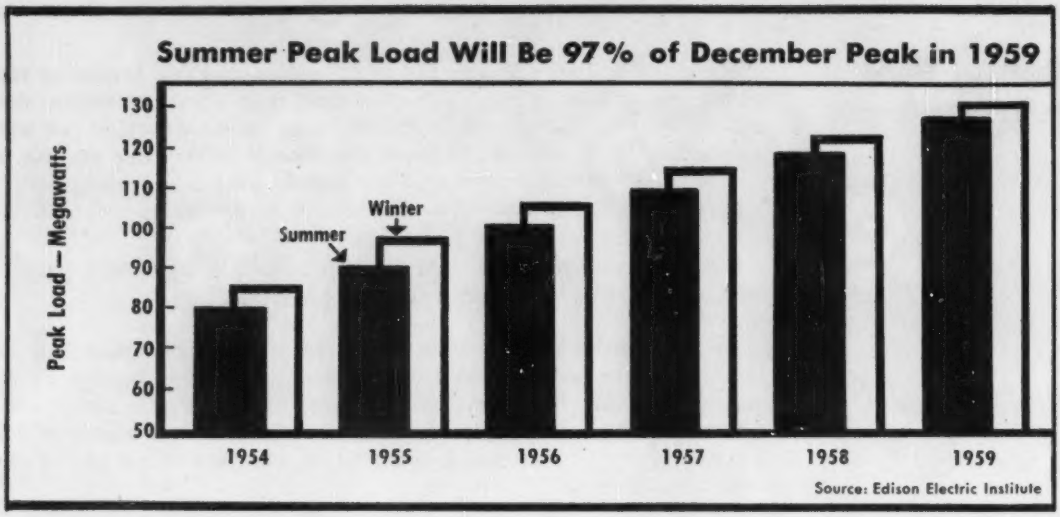
• • •

Utility reserve margins are headed down to the lowest level since 1952. Electrical World's latest study (to be published Sept. 17) indicates the margin between capability and peak load in December will be down to 15.5%—a drop of 3.1 percentage points from last year. The reason: continued load growth and a very low level of capacity additions due to delays in equipment deliveries.

The Outlook for Utility Sales



STATISTICS



Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity, Peak—Class 1 Systems, Estimated Dec. '56 Peak — million kw	May	117.43	116.78	106.32	10.4
	June	97.00	92.6	86.6	12.0
	June	106.06	106.00	103.46	2.5
Production—billion kwhr	May	49.09	47.49	43.35	13.2
Hydro		11.70	11.55	9.81	19.3
Fuel		37.39	35.94	33.54	11.5
Sales—billion kwhr	June	44.53	44.18	40.10	11.0
Residential		10.98	11.02	9.62	14.1
Commercial		7.28	6.74	6.51	11.8
Industrial		23.80	24.04	21.62	10.1
Other		2.48	2.38	2.36	5.1
Fuel Consumption	June				
Coal—million tons		12.34	12.05	11.07	11.5
Oil—million barrels		4.61	4.47	4.69	−1.7
Gas—billion cu. ft		127.04	110.51	107.42	18.3
Net Income Class A & B Co's—$ million	June	102.20	103.15	92.00	11.1
Residential Customers—millions	May 31	44.87	44.76	43.63	2.8
Revenue per kwhr		2.62¢	2.62¢	2.67¢	−1.9
Avg kwhr per customer		2,858	2,838	2,637	8.4
Avg annual bill		$74.88	$74.36	$70.41	6.3

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	July	129	141	130	−0.8
ENR Construction Cost	Aug.	146.0	145.6	140.9	3.6
BLS Cost-of-living	July	117.0	116.2	114.7	2.0
NEMA Sales					
Insulation materials	June	156	158	158	−1.3
Electric appliances		106	103	118	−10.2
Wholesale prices	May				
Motors and generators		132.1	130.4	120.8	9.4
Transformers and regulators		137.5	135.3	127.3	8.0
Switchgear and fuses		151.2	149.0	135.6	11.5
GNP—annual rate—$ billion	2nd Qtr.	408.3	403.4	387.4	5.4

Your Business

Live it up . . . electrically. Your business is doubly concerned with electricity. You help produce, distribute, or sell it, and you also use it. To keep you up-to-date on new and novel applications of electricity, we hasten to review these recent developments:

Do-it-yourself ice skating rink. A Yuma, Ariz., air conditioning dealer rigged up a small ice skating rink to demonstrate his equipment at the county fair. The exhibit made such a hit the dealer is now talking about an ice rink for every home.

Can opener attachment. An all-purpose electric can opener will be available in October. It can be attached to a motor base also designed to power either an ice crusher or meat grinder.

Electric "Bunsen burner". A Portland, Ore., high school student has come up with a forced draft electric heating unit designed to serve the purpose of that old laboratory stand-by, the Bunsen burner. It's not on the market yet.

No more cold feet . . . or cool babies. Manufacturers now offer heating pads suitable for use as office foot mats, play pen warmers, and under-the-rug room warmers. Keep cozy . . . electrically.

Home decoration in a wink. Recently announced color bulbs allow the homemaker to improve appearance of fabrics, walls, and atmosphere simply by screwing in bulbs that give her the effect she's after. The pastel lamps have such exotic names as Candlelight, Aqua, Spring Green, Sun Gold, Dawn Pink.

"Big brother" TV. As promised, mama will soon be able to keep an eye on the children anywhere in the house by use of closed circuit television. Mama's problem is to figure out where she wants the busy-eye receiver located.

Air-conditioned fine arts. Scholarly paper tells how air conditioning—electric, of course—prevents damage to museum displays of paintings and other treasures. Lint from visitors clothing and air, says the paper, tends to collect moisture, mold, and fungi spores which speed deterioration of art objects.

• • •

Engineer-typists wanted. A British editor, noting the increased use of electronic computing machines in government offices, still thinks it will be a long time before he will see want-ads for "engineer-typists" or "shorthand-electricians."

• • •

You may have heard some amusing stories this Summer. If so, please heed this plea:

If you have a bit of news, send it in.
Or a joke that will amuse, send it in.
A story when true, an incident that's new.
We want to hear from you, send it in.

Just address it to Your Business Editor, Electrical World, 330 W. 42nd St., New York, 36, N. Y.

Your Health—MS, A medical puzzle

REX H. WILSON, MD, Medical Director, B. F. Goodrich Co

He had been athletic all of his life. Now at age 40 he was complaining of weakness in one leg with some loss of sensation, a peculiar gait in walking and some difficulty in urinating. He also had developed a speech defect, some tremor of the hands and blurring of vision.

The diagnosis was multiple sclerosis. This chronic intermittent disease of the brain and spinal cord is more common to men. There are many areas of degeneration throughout the central nervous system. The degenerative process, the cause of which is unknown, may continue until invalidism and death result. However, it may take many years to progress since there are periods of remission of part or all symtoms.

Multiple sclerosis is manifested by disturbed functions in one or more different areas. A slow halting speech, tremor, visual disturbances, leakage of urine, weakness of one limb, difficulty in walking, emotional disturbances and sensory changes are common symptoms.

The diagnosis of multiple sclerosis is largely dependent upon the reflex changes that are present. Early in the disease there is a lack of definitive physical findings.

Multiple sclerosis is one of the most frequent of nervous diseases. Treatment is difficult because the cause is not certain. The acutely sick patient should be in bed. Vitamins, liver extract, blood transfusion and symptomatic treatment are all used. Some physicians prescribe antispasmodic drugs, physiotherapy and psychotherapy.

Multiple sclerosis is a bewildering but not a hopeless disease. Most patients are handicapped only partially or not at all. Someday medical research will supply the tools to combat it effectively.

WASHINGTON COMMENT

SEC Proposes Simpler Stock Advertisements

Electric utilities doing business before the Securities and Exchange Commission—and indeed all businesses that make public stock offerings—can take comfort in the new policy proposals the agency has just announced.

In essence, the commission is continuing a trend established in the last few years to make life easier for companies, while still keeping to its job of protecting the public.

Comments on Proposals Are Invited

The new proposals, put out for comment by Oct. 31, would:

- Liberalize the rules governing what utilities and some other issuing companies can say in advertising stock offerings to the public. The new prospectus would fall in between the two choices now available—(1) the so-called "tombstone" advertisement listing only the amount of the issue, the company name, the offering price, and names of the investment companies involved; or (2) distributing the expensive and bulky prospectus that is filed with the SEC.
- Adopt a policy statement defining the types of situations in which the SEC will refuse to shorten the statutory 20-day waiting period after a stock offering is registered and before it can be effective and stock sales made.

The latter proposal is an effort to put into formal language procedures the commission has been following, in general, to shorten the waiting period.

Several of the grounds for refusing acceleration are reasonably familiar.

SEC's proposal spells out two additional grounds for denying acceleration. One is where the issuing company, a controlling stockholder, or an underwriter is under investigation for possible securities violations. And acceleration may be refused if an underwriter does not comply with the commission's net capital rules, which require at least $1.00 of capital for every $20 of aggregate indebtedness.

The first proposal is the more newsworthy and probably will ease the public relations task of utilities in making new offerings.

New Stock Summary Would Be Attractive

The summary is obviously attractive—it would carry, in condensed form, information on the nature of the issuing company's business, the offering price and underwriting terms, intended use of the proceeds, a summary of earnings, and outstanding options.

Such information would make a better presentation in newspapers and periodicals, and in pamphlet form. SEC hopes its use would broaden the public dissemination of registration disclosures and make it easier and less costly for underwriters and brokers to reach a larger potential market.

Of course, the full disclosure regulations would still apply as to the information a company has to file with the commission. But for promotion, the "summary prospectus" would be more informative and more intelligible to new buyers of stock.

TECHNICAL NOTES

Electron bombardment makes polyethylene stable for high-temperature applications without impairing its electrical and mechanical qualities.

Faster, more sensitive relays require care in application lest they diagnose normal lightning arrester discharges as equipment faults to open circuits unnecessarily.

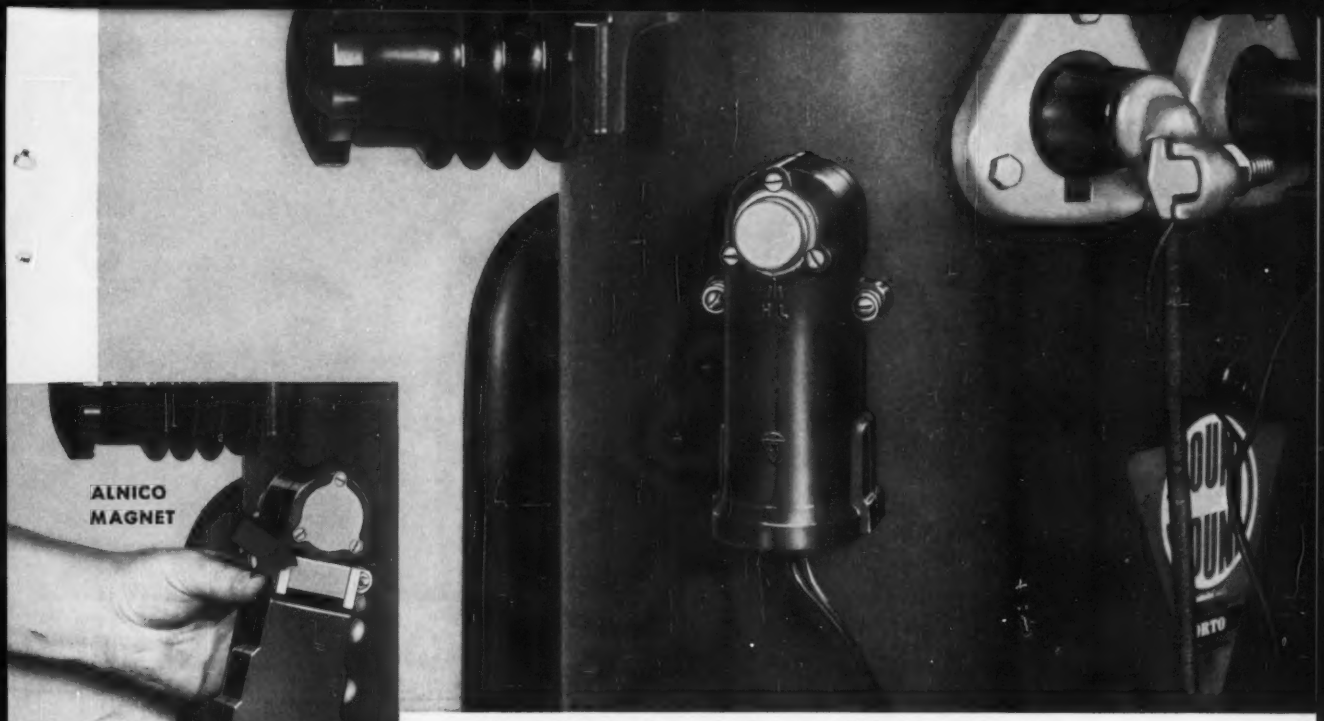
Economies from large generating units will offset the cost of spinning reserve in older small units and provide better operating economy.

Cathodic protection for coolant water tanks of a nuclear reactor requires close to —1.0 volt maintained at the tank surface by regulated rectifiers driving high-silicon cast-iron anodes. Anodes must be spaced closely to overcome resistivity of highly treated water with extended temperature range. And the water velocity demands firm anchoring of the anodes.

Coolant flow in nuclear reactors must be powered to limit interruptions to a few seconds. Precautions at Hanford include high-flywheel-effect pumps, multiple supply buses and feeders from the normal source, and, normally paralleled with it, an emergency power plant large enough to carry essential auxiliaries left on it automatically by a system disturbance.

Unit design provides for future additions to a substation without major service interruptions.

Heavily contaminated insulators rarely fail until moisture hits them.



For mounting on transformers already in service, Alnico permanent magnet holds overload indicator on transformer tank. It will not creep or vibrate loose. The device provides an accurate yet economical overload indication.

New L-M Thermal Overload Indicator Easy To Install; Provides Constant Check

Simply attached and held by permanent magnet; provides continuous overload check; avoids service interruptions.

All you have to do is place the L-M thermal overload indicator against the transformer tank already in service, and it is installed. An Alnico permanent magnet holds the indicator firmly against the transformer tank. The indicator will not creep or vibrate loose. On new L-M Round-Wound® transformers the indicator is attached to a bracket permanently welded to the transformer tank.

This new device provides visible indication of overloads on conventional transformers up to 50 kva by means of a drop-down red light or drop-down luminescent tube. The luminescent type is provided with a nylon cord which can be attached to a cover bolt or other convenient projection to prevent the indicator from falling in the event the pole receives a severe shock.

Continuous Overload Check Without Interrupting Service

The L-M overload indicator provides an economical and reliable solution to load-study problems. It enables you to keep a continuous overload check on your distribution load and also eliminates the costly and laborious work required to take spot load checks.

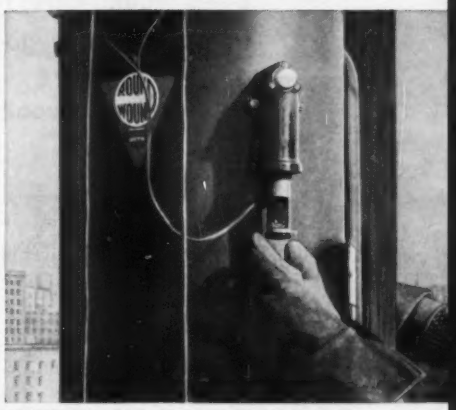
In addition, the indicator on a conventional transformer does not interrupt service. It serves as a tool to reduce transformer burnouts and maintain service continuity by indicating serious overloads before they can cause trouble.

Compensates For Ambient Temperatures

The overload indicator measures tank-wall temperature (a function of top oil and hot spot temperatures), and makes proper allowance in transformer loading for variations in ambient temperature. Accuracy is sufficient for all practical purposes.

Indication Easily Seen

The overload indicator is available with a red light or reflecting tape. Both types are exceptionally brilliant and easily distinguished in daylight as well as at night. Indicator with red light requires an electrical connection to the transformer.



Indicating target is easily seen during the day or night. It is quickly and easily reset by simply pushing the indicating tube up.

Get Complete Information

L-M overload indicators are available for mounting on transformers in service, with permanent magnet, or stainless steel wire to wrap around tank. On new L-M Round-Wound transformers, indicator is attached to a bracket permanently welded to the transformer tank. Ask the L-M Field Engineer for bulletins and complete information. Or write Line Material Company, Protective Equipment Division, Milwaukee 1, Wis.

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LINE MATERIAL *Protective Equipment*

A McGRAW ELECTRIC COMPANY DIVISION

L-M transformers provide balanced performance which results in low losses. Extremely quiet operation is another advantage. L-M's new obround tank design, shown here, retains all outstanding Round-Wound performance characteristics.

How L-M's Round-Wound® Design Assures Consistently Low Losses, Greater Revenue

L-M's wound-core, round-coil construction provides the most efficient design for low losses, good regulation, greater revenue at all power factors.

By **R. W. HARTSOOK**
Chief Engineer
Small Distribution
Transformers
Line Material Company

One of the most important objectives in transformer design is to achieve a balance of low copper loss, low exciting current, and low core loss without sacrificing other desirable performance characteristics. The Round-Wound design has many inherent advantages that aid the designer in achieving this objective.

Round-Wound Design Offers Balanced Performance

L-M's Round-Wound transformer design consists of a wound core, with a cruciform cross section closely approximating a round form. Long round coils are wound directly onto the wound core. This construction gives L-M transformers inherent advantages to minimize losses and offer balanced performance.

Low Copper Loss

In the Round-Wound transformer, the core cross section is nearly round. As shown in Figure 4 at right, a round core has a much smaller perimeter than a rectangular core of the same cross-sectional area. Therefore the turns in a Round-Wound coil are shorter. (Figs. 2 and 3). With the same cross-section wire and the same number of turns, there is less total length of wire and less watts of copper loss.

In addition, the higher efficiency of the core-coil arrangement actually permits fewer turns. The combination of smaller turn diameters and fewer turns results in low reactance and impedance, giving the desirable regulation indicated by the curves in Figure 1.

High Overload Capacity

Low copper loss also contributes to better overload capacity, since copper loss watts increase as the square of the overload on a transformer. Therefore any reduction in copper loss results in a substantial increase in overload capacity. This is a bonus over the excellent overload capacity of the Round-Wound transformer resulting from its exceptionally good cooling characteristics.

Low Exciting Current, Low Core Loss

L-M's core is tightly wound of a continuous strip of oriented steel. Coils are wound directly onto this core by means of L-M's exclusive winding machine. Since the core is not cut, unwound, or disturbed in any way after annealing, there are no air gaps to break up the flux path. This construction results in low exciting current and high magnetic efficiency of the core.

Quiet Operation

L-M's wound-core construction eliminates all laps, flaps and gaps in the laminations. This contributes greatly to the extremely quiet operation of L-M's Round-Wound transformer.

Get Details on L-M's Round-Wound Transformers

Ask the L-M Field Engineer for complete information on L-M's Round-Wound design, and bulletins. Or write Line Material Company, Transformer Division, Zanesville, Ohio.

LINE MATERIAL
A McGRAW ELECTRIC COMPANY DIVISION

L-M's wound-core, round-coil construction provides exceptionally good cooling for high overload capacity and almost an ideal magnetic circuit to minimize losses.

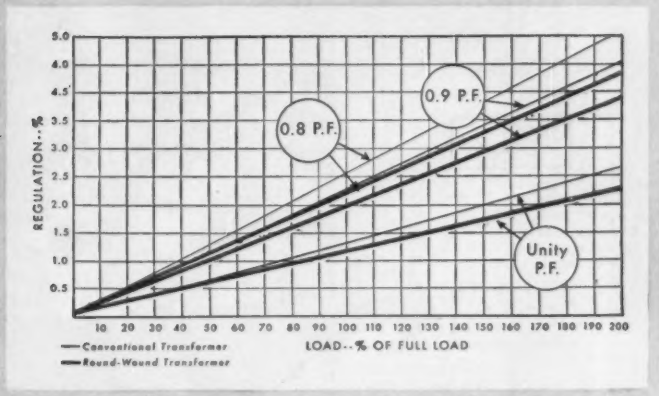


Fig. 1. Round-Wound offers good regulation at all power factors. Regulation of new 25 kva 2400-120/240 volt Round-Wound transformer compared with that of older design, showing effect of load and power factor on regulation. Multiply the difference in regulation by the number of old distribution transformers on your system, and see how much more revenue these modern L-M transformers produce.

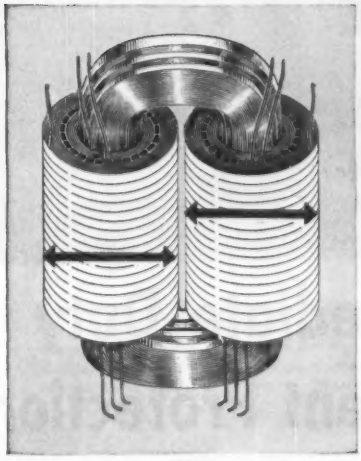


Figure 2. Round-Wound Design

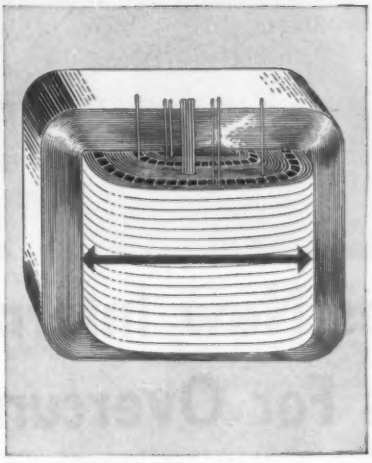


Figure 3. Shell-Type Design

Compare the difference in mean-turn diameter. L-M's Round-Wound design with the long round coils has a lower mean-turn diameter than a shell-type design. This contributes to L-M's low losses, which in turn result in good regulation, greater revenue at all power factors.

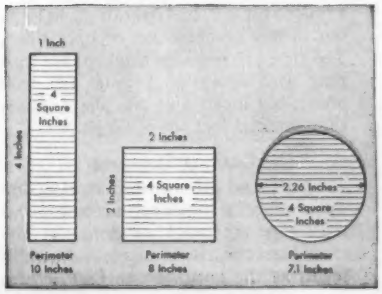


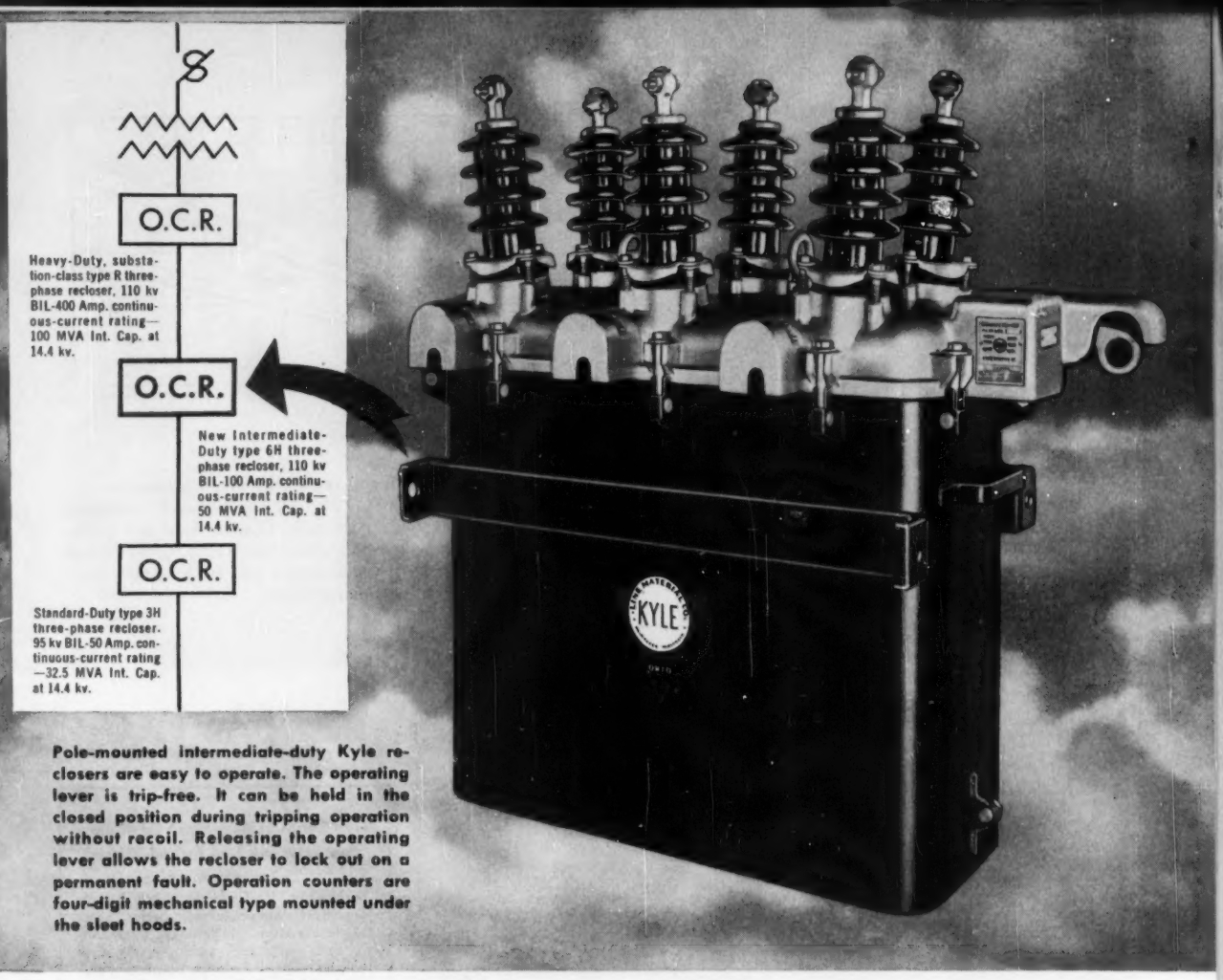
Figure 4. Compare the difference in perimeter. Each of these core cross sections has an area of 4 square inches. It takes only 7.1" of wire to make a turn around the core of round cross section typical of L-M transformers. This results in better utilization of copper, lower copper loss.

Five Reasons Why More Customers Are Selecting L-M Round-Wound Transformers

1. **Higher Uniform Impulse Level:** Round coils are *wound* into shape. Therefore insulation is not damaged by malleting into rectangular shape. Coils have longer creepage distance between windings and between leads.
2. **Higher Short-Circuit Strength:** Round coils are not stressed out of shape under high radial short-circuit forces. Strong steel frame, heavy clamping bolts, sturdy maple blocks and varnished coils prevent axial movement.
3. **Higher Short-Time Overload Capacity:** Round coils and the cruciform cross-section core expose large surfaces to cooling oil. The result is relatively low hot-spot temperatures, which add considerably to high short-time overload capacity.
4. **Balanced Performance:** The core is a continuous wound strip of oriented steel. Coils are wound directly onto this core. Since the core is not cut, unwound, or disturbed in any way after annealing, there are no air gaps to break up the flux path. This results in low exciting current and core loss.

   The wound-core, round-coil design permits fewer winding turns and smaller turn diameter. This results in low impedance, and provides better regulation at all power factors.
5. **Additional Capacity on Pole:** L-M's new obround tank design makes the unit smaller and lighter, with shorter moment arm from the pole. This combination reduces the bending moment on the pole and crossarms, and thus greatly increases the potential capacity of existing transformer structures.

Transformers


O.C.R.
Heavy-Duty, substation-class type R three-phase recloser, 110 kv BIL-400 Amp. continuous-current rating—100 MVA Int. Cap. at 14.4 kv.
O.C.R.
New Intermediate-Duty type 6H three-phase recloser, 110 kv BIL-100 Amp. continuous-current rating—50 MVA Int. Cap. at 14.4 kv.
O.C.R.
Standard-Duty type 3H three-phase recloser. 95 kv BIL-50 Amp. continuous-current rating—32.5 MVA Int. Cap. at 14.4 kv.
KYLE

Pole-mounted intermediate-duty Kyle reclosers are easy to operate. The operating lever is trip-free. It can be held in the closed position during tripping operation without recoil. Releasing the operating lever allows the recloser to lock out on a permanent fault. Operation counters are four-digit mechanical type mounted under the sleet hoods.

L-M Announces New Intermediate-Duty Kyle® Reclosers For Overcurrent Protection

New type 6H 3-phase reclosers incorporate all outstanding features of L-M's high-speed Kyle reclosers; available in 5 to 100 ampere ratings, 2.4 to 14.4 kv; symmetrical interrupting ratings to 3000 amps. Type 4H single-phase, intermediate-duty reclosers also available.

By **WILLIAM J. WEINFURT**
Chief Engineer
Kyle Products
Line Material Company

L-M's new type 4H single-phase and type 6H three-phase reclosers are self-contained, intermediate-duty units, designed to segregate permanent faults, and to clear transient or non-persistent faults on urban and rural distribution systems. They provide high-speed circuit clearing in less than 2 cycles with symmetrical RMS interrupting ratings up to 3000 amps. 4.8 kv and below, and 2000 amps. 14.4 kv.

Retain Kyle Design

All the outstanding features of L-M's Kyle reclosers are incorporated in these new intermediate-duty reclosers. The timing mechanism is the service-proved Kyle hydraulic system with a selection of three time-current characteristics: Fast (A), Retarded (B), and Extra Retarded (C). Sequences can be easily adjusted for 2, 3, or 4 operations to lockout in any combination of operations. The type 6H provides single-phase tripping with operation counter for each phase, but lockout of one phase causes simultaneous lockout of all phases.

Contact Structure

Contacts and arc interrupter structure utilize the snap toggle contact action and cross-blast arc extinction principle. The cross-blast consists of two arcs drawn in series as the contacts part. Pressure

LINE MATERIAL
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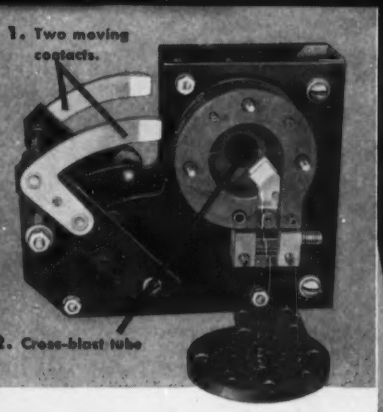
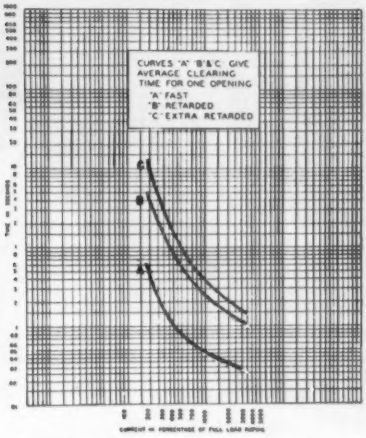
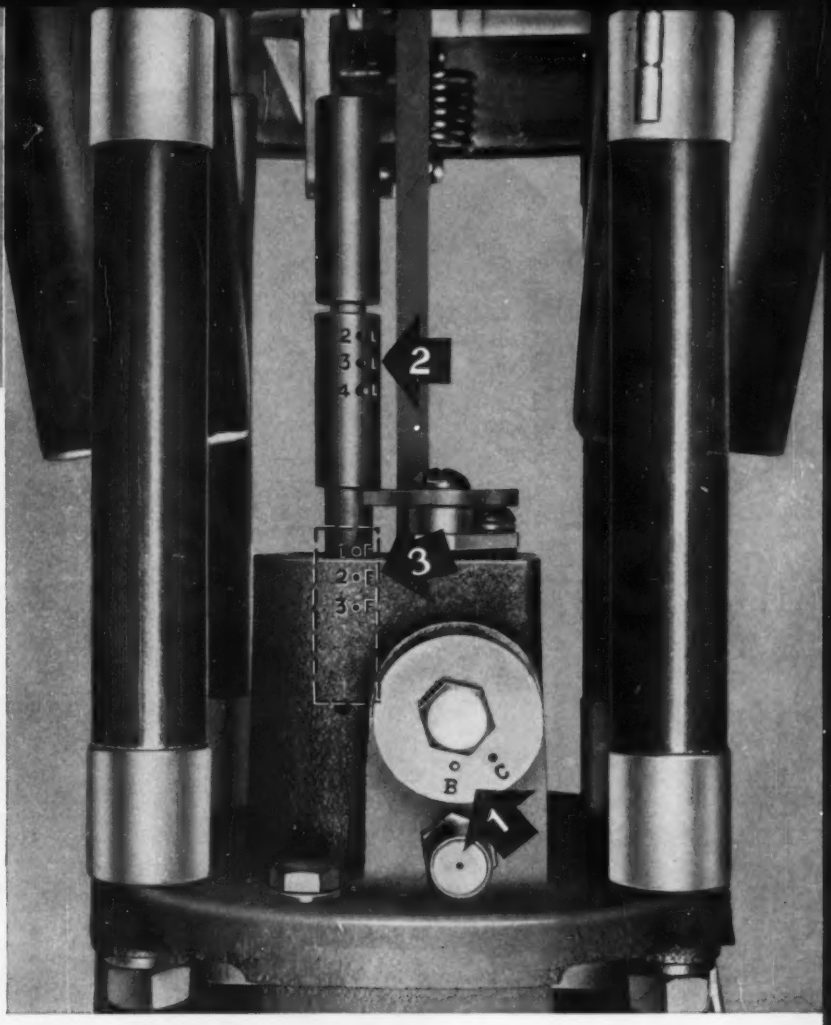


The new intermediate-duty reclosers utilize the service-proved cross-blast arc extinction principle. Two arcs in series are drawn as the contacts part **(1)**. Pressure generated by one arc forces oil into the path of the other arc, cooling it and extinguishing it rapidly. Note the long double-break **(2)** and cross-blast tube connecting the two interrupting chambers.



Time-Current Curves for series overcurrent tripping of L-M's intermediate-duty Kyle reclosers. Each phase of the type 6H trips individually until the final pre-selected operation, when all three phases lock open simultaneously.



Time-current characteristics and operating sequences can be easily adjusted in the field. Photo shows the hydraulic system of the type 6H recloser. Time-current characteristic is selected by moving disc to curve "B" or "C" **(1)**. Number of operations to lockout is selected by adjusting vertical extension of lockout piston **(2)**. Adjustment of sequences (number of fast and delayed operations) is obtained by the proper positioning of the roll pin located at **(3)**.

generated by one arc forces oil into the path of the other arc, cooling it and extinguishing it rapidly. Arcing time over the range of fault current ratings averages less than one-half cycle.

Moving contacts are silver-plated copper tungsten to reduce pitting and assure long life to the arcing surface. In operation, the moving contact wipes into the stationary contacts, thus insuring a cool, low-resistance, load-carrying contact. In addition, all current-carrying parts of the contacts are silver-plated.

External Construction

Terminals are universal plated type and will accommodate either copper or aluminum from No. 6 solid through 250 MCM stranded in either a vertical or horizontal position.

Bushings are wet-process, 15 kv porcelain, externally clamped to head. Bushings have approximately 12″ creepage distance. The recloser will also be available with 15″ creepage-distance bushings where desired.

Get The Whole Story On L-M's Kyle Reclosers and Sectionalizers

L-M offers the most complete line of reclosers—single- and three-phase—from substation to load. Ask your L-M Field Engineer for information and bulletins on Kyle apparatus and complete coordination. Or write Line Material Company, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

Kyle type 6H 3-phase reclosers available in normal load ratings

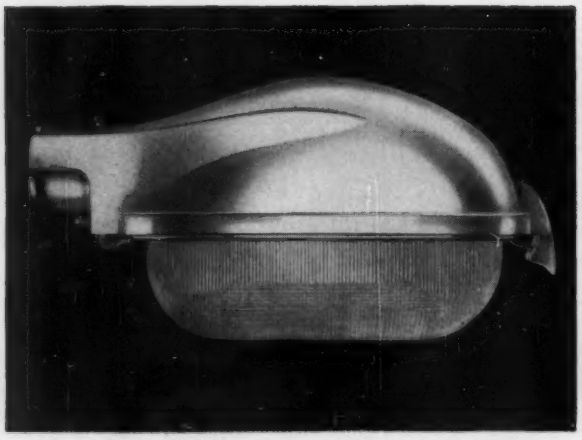
FROM 5 TO 100 AMPERES*

Ratings Amps.	Min. Trip Amps.	Inter. Ratings RMS Amperes 2.4-4.8 kv	Inter. Ratings RMS Amperes 14.4 kv
5	10	200	200
10	20	400	400
15	30	600	600
25	50	1000	1000
35	70	1400	1400
50	100	2000	2000
70	140	3000‡	2000
100	200	3000‡	2000

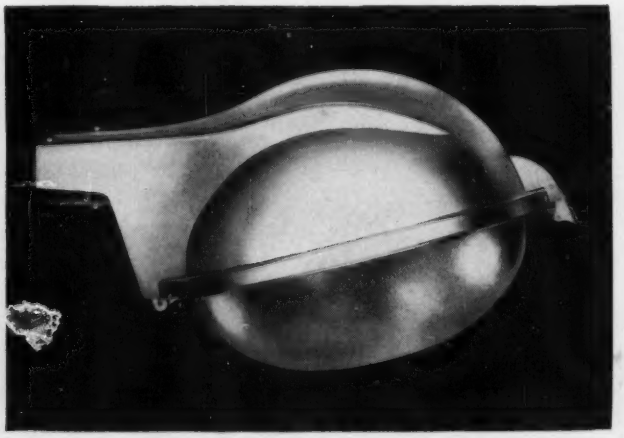
*Insulation Level: 110 kv BIL.

‡2,500 RMS amperes maximum Inter. rating at 8.32 kv.

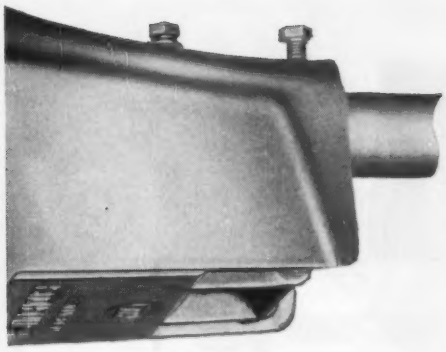
Kyle® Reclosers



OV-20 uses 11,000-lumen CH-5, 15,000-lumen AH-1, 20,000-lumen EH-1, and 19,000-lumen JH-1 mercury lamps. Type II, III and IV distribution.



OV-60 uses 35,000-lumen AH-18, 33,000-lumen BH-18, 52,000-lumen AH-15, and 49,000-lumen BH-15 lamps. Type IV distribution.



New Westinghouse OV-35

. . . the first luminaire designed specifically for fluorescent mercury lamps

Westinghouse, pioneer in the development of mercury street lighting — the OV-20 and OV-60 — now presents the OV-35 luminaire which can be used with the 400-watt J-H1 or the 700-watt B-H18 fluorescent mercury lamps.

This third member of the Westinghouse mercury group now offers you a complete selection of mercury luminaires for any roadway application — regardless of width or traffic conditions.

The new OV-35 is the first street-lighting luminaire to include a completely sealed optical system — bugs, dirt or moisture cannot get in. Like the OV-20 and the OV-60, this new luminaire assures the best possible night visibility and a greater uniformity of pavement brightness. It inherits their same outstanding plus features, too . . . such as one-piece cast aluminum housing, new optical system, one-hand maintenance, and smooth good looks.

Whatever your roadway lighting requirements, be sure to specify Westinghouse mercury luminaires. More information? See your nearby Westinghouse representative. Or, write Westinghouse Electric Corporation, Lighting Division, Edgewater Park, Cleveland, Ohio. J-04405

WATCH WESTINGHOUSE!

COVER THE PRESIDENTIAL CAMPAIGN ON CBS TV AND RADIO!

CRESCENT AND CRESTOLOY

outsell all other ADJUSTABLE WRENCHES

CRESTOLOY Wrenches are forged from a special alloy steel permitting thinner, trimmer design with greater strength and less weight than conventional types. They are available in Single End patterns, 4″ to 24″ size. Double-end in four models combining 4-6; 6-8; 8-10; 10-12 inch sizes. The 15″, 18″ and 24″ sizes, available in Single End pattern only, are distinguished by their tapered handles. There is no stronger or finer Adjustable Wrench than CRESTOLOY.

CRESCENT Wrenches are forged from selected carbon steel and specially heat-treated to increase their toughness and durability. Due to their lesser cost and relatively great strength, they are widely used in industrial and service operations where thinness is not essential. Available in Single End Patterns, 4″ to 18″.

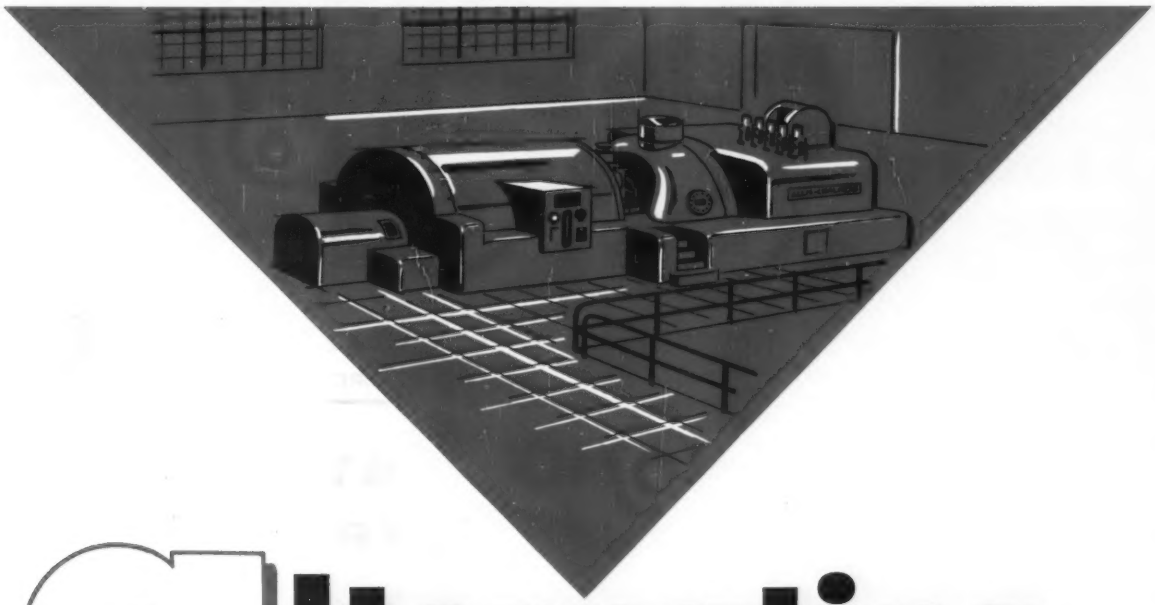
Both CRESCENT and CRESTOLOY Wrenches represent the best in design and workmanship, and carry the same guarantee.

CRESCENT and CRESTOLOY TOOLS are sold by hardware dealers and industrial distributors everywhere. Look for the bright yellow Crescent Display panels and select from one of the world's greatest assortments of quality hand tools.

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

A NEW Era in Reliable High Speed Excitation System Response



alternating current

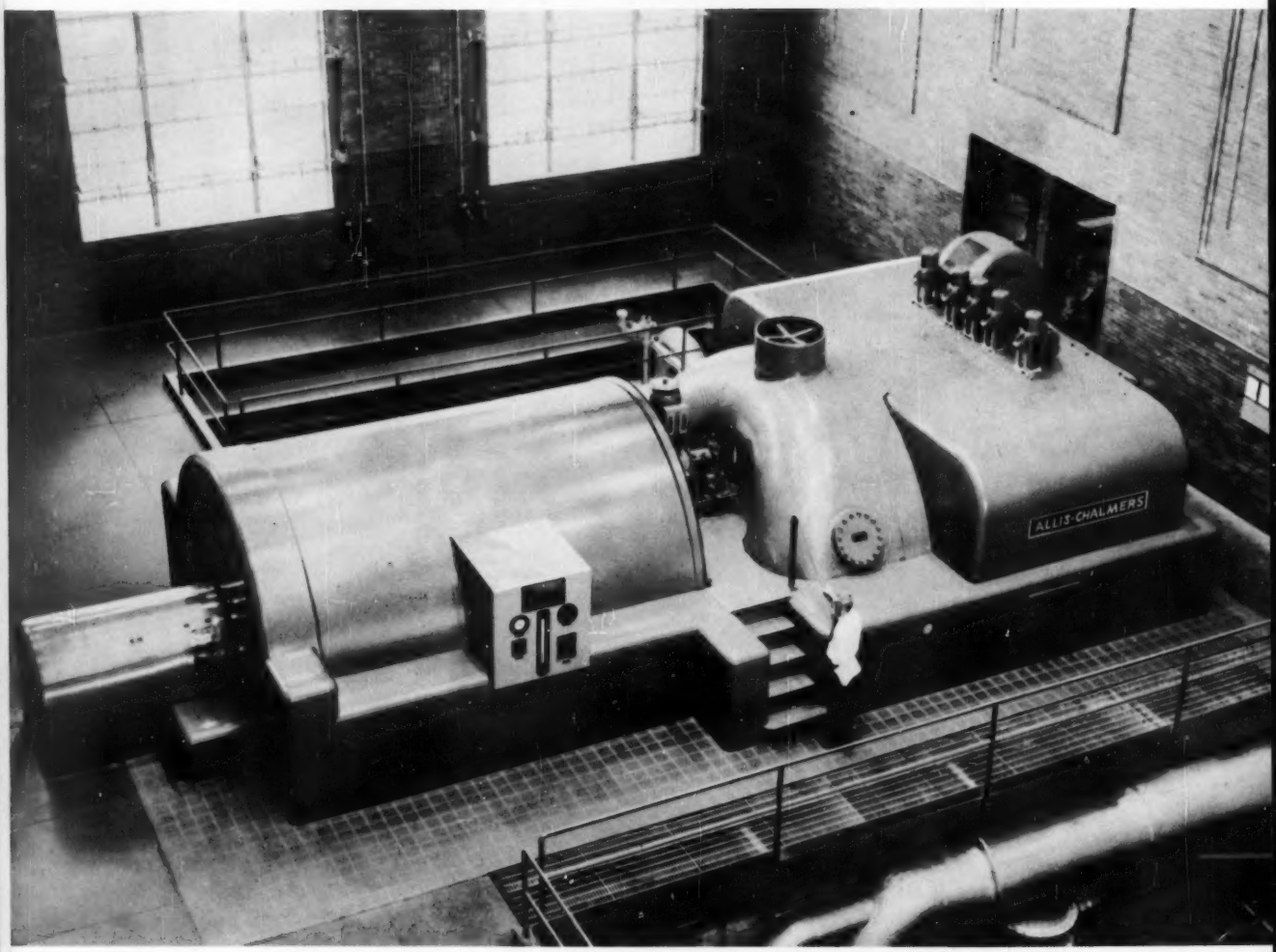
Commutator-less Excitation System

ALLIS-CHALMERS

A-5138

. . . now Installed and

alternating current



A new Generator Installation including the ac excitation system has been in service in a midwestern power plant. The steam turbine-generator unit is rated 33,000 kw.

ALLIS-

Operating

Commutator-less Excitation System

HERE'S PROOF

This All-New Alternating Current Excitation System Meets the Need for Reliability and Rapid Response in Excitation Systems for Turbine Generators.

Here is a new era in high speed exciter response through the use of inductor alternators and rectifiers for excitation. Magnetic amplifiers control the exciter magnetization by absorbing reactive kva from the alternating current exciter output.

Changes in exciter voltage are now accomplished as rapidly as the magnetic amplifier current can be changed. Overall excitation system response is determined mainly by the small time-constant of the magnetic amplifier.

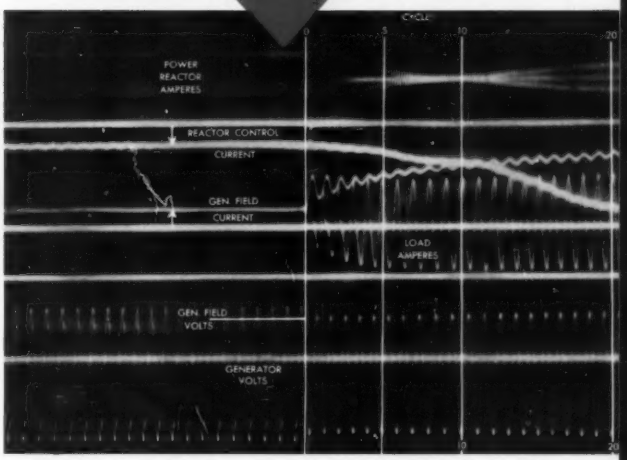
The ac output of the inductor alternator is converted to dc by selenium rectifiers, serving the purpose of a conventional commutator.

Increased Reliability and Safety

This new excitation system represents a significant advance in reliability and speed of operation. The ability to rapidly increase voltage applied to field is an important factor in maintaining generator stability. It permits safer operation closer to the unit stability limit and at higher power factor.

The extreme simplicity of the Allis-Chalmers ac system, the elimination of commutators, the use of all static components in the regulating and control circuits will provide more maintenance-free operation and greater continuity of service than any existing excitation system.

For Complete Information, contact your local Allis-Chalmers representative, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



This oscillogram shows the response speed gained with maximum reliability under the ac excitation system. Load was added to generator operating under no load.

Installed on the level below are the rectifier cubicle and ductwork for the ac excitation system on the new turbine generator shown at left.

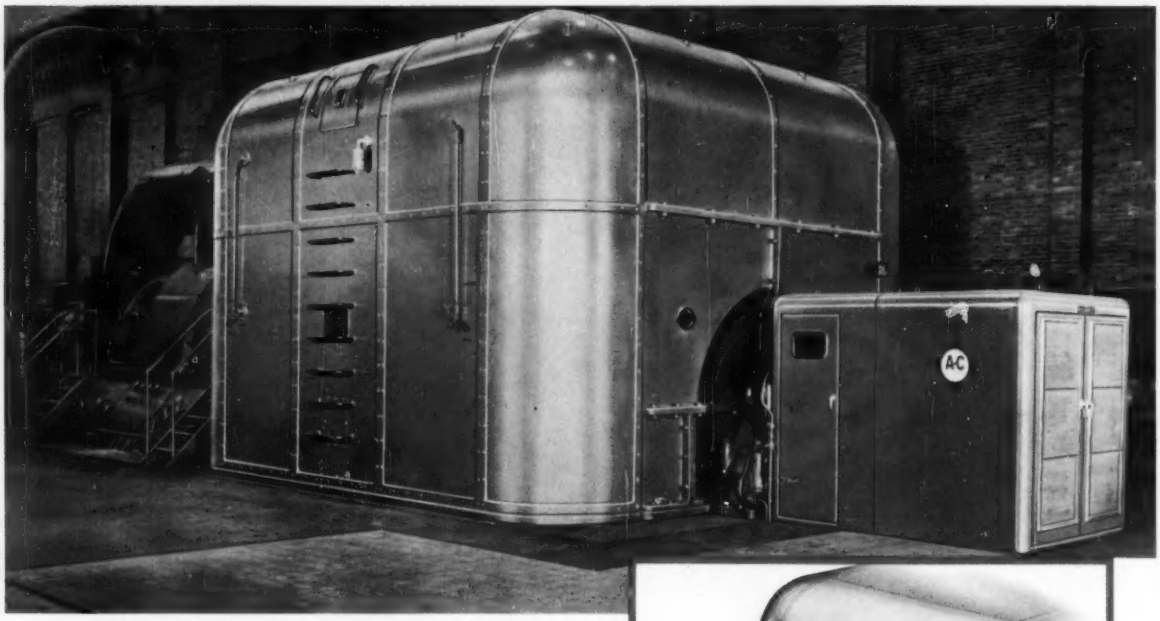
CHALMERS

A-C ALLIS-CHALMERS

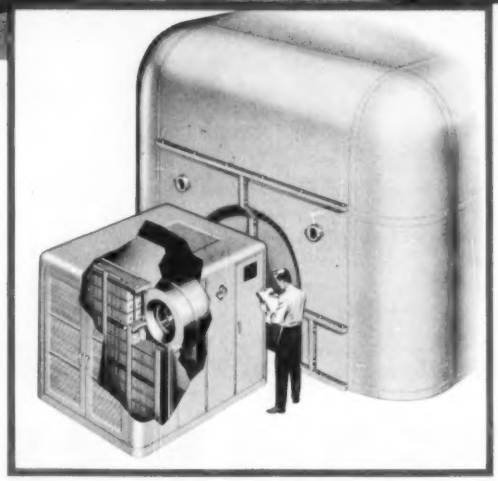
Alternating Current Excitation System

Installed on Existing Units

Not only is this excitation system intended for use on NEW steam turbine-generator units, but it can also be used on older generator units as the one shown here.



Here is the new excitation system added to a 43,750-kva generator which had been installed in 1938 without a direct-connected exciter. A number of additional installations are now planned, with exciter rating varying from 75 to 300 kw.

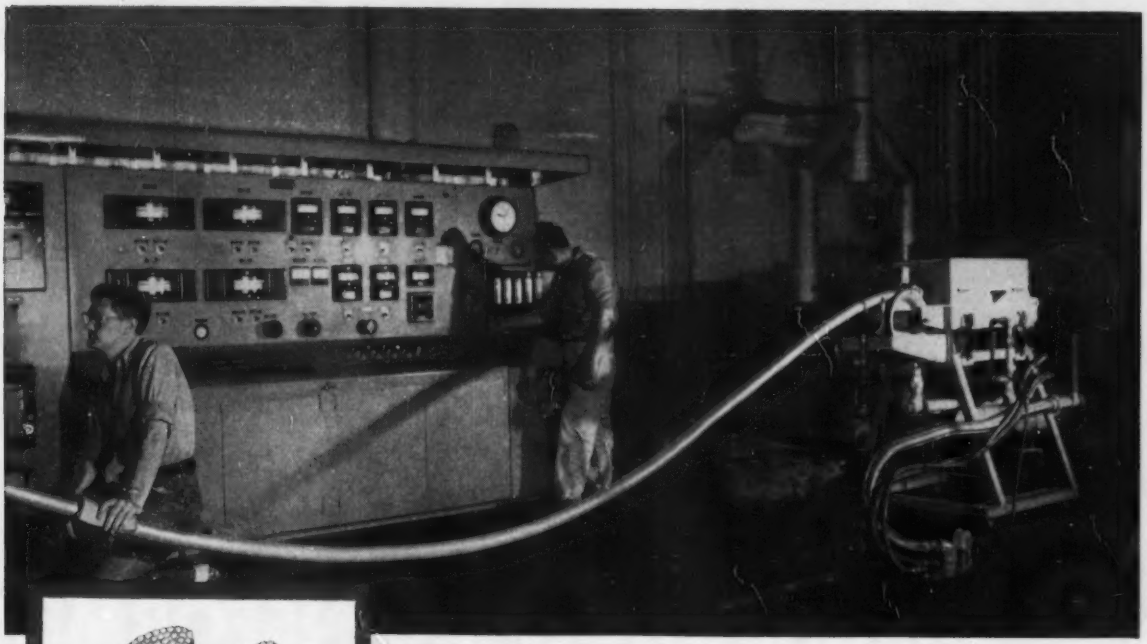


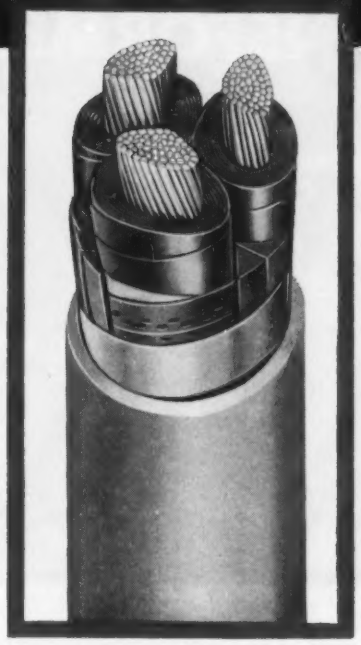
Cutaway view of the selenium rectifier cubicle portion of the ac excitation system installed on an older generator in a midwestern power plant. This installation was attained with a minimum structure modification, with exciter, rectifiers, and magnetic amplifiers in a single housing.

AC ALLIS-CHALMERS

ALLIS-CHALMERS

ROEBLING INVESTS IN YOUR FUTURE





New continuous lead extrusion press vastly improves "paper and lead" cable sheathing

THIS NEW CONTINUOUS LEAD EXTRUSION PRESS and control board revolutionize the extrusion of sheathing for Paper Insulated Cable. Because its operation is continuous there are no press stops, no recharging and, of outstanding importance to you, *there are no charge welds.* In addition, the control board, shown at the left, automatically controls and records all temperatures. Every inch of the resultant cable is just like every other inch... the "paper and lead" cable sheath is perfect in its concentricity, physical properties and general uniformity.

This press is the finest obtainable today. It is only part of Roebling's program of modernization for producing electrical conductors of modern, high quality.

Our engineering and metallurgical staffs are always glad to consult with you on your individual cable problems. A letter or phone call will bring action.

ROEBLING ELECTRICAL WIRES AND CABLES ARE AVAILABLE WITH EITHER COPPER OR ALUMINUM CONDUCTORS

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 11-15 STILLING ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3240 GLENDALE-MILFORD RD., EVENDALE • CLEVELAND, 13235 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6316 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • PITTSBURGH, 1723 HENRY W. OLIVER BLDG. • SAN FRANCISCO, 1740 17TH ST. SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK 6, N. Y.

If Paul Revere galloped through Lexington

His way would be lighted with POWER

from **Pole Star**

DISTRIBUTION TRANSFORMERS

Aroused and warned by the most famous nocturnal equestrian of all time, the Minute Men began forming to meet the oncoming British Redcoats during the early hours of the morning of April 19, 1775. The historic skirmish that took place a few hours later might be considered minor by present-day numerical standards (only eight were killed in the initial clash at Lexington, Mass.), but of course *many* things have changed in 180 years.

Pole Stars are available in all single phase sizes from 3 through 500 kva, through 67,000 volts. Protected Pole Star Transformers are available through 100 kva.

POLE STAR pt

PENNSYLVANIA

For example, if Paul Revere were to gallop through Lexington tonight, his way would be lighted with power from Pole Star Distribution Transformers. In fact, the pictured installation — on Massachusetts Avenue, across from Minute Man Lane, Lexington — is typical of many throughout the Boston-Lexington-Concord section, so that a large percentage of the territory covered on that famous midnight ride of yesteryear now is illuminated with power from Pole Star Transformers.

Pole Stars are serving as vital links in distribution systems throughout the *entire* United States — having gained nation-wide recognition in a period of just ten years. That's a short time from the historian's point of view, but it's long enough to prove conclusively that the Pole Star patented lap-on-top core *does* make a difference. Write for more details.

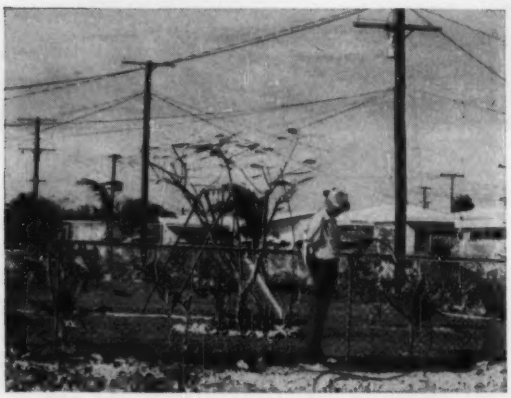
TRANSFORMER COMPANY **CANONSBURG, PA.**

A Mc Graw Electric Company Division *Greater Pittsburgh District*

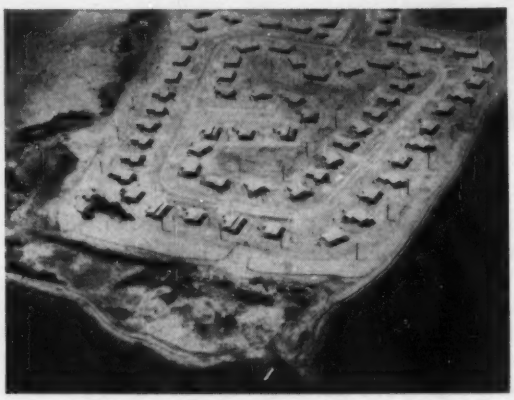
KAISER WIRE

FOR UNSURPASSED SERVICE

ONE-THIRD of this 25-mile line is over salt water. Scene above shows a channel crossing with 4/0 ACSR, with the Atlantic Ocean on the left. This is a good example of the unusual problems solved by Key West Electric with Kaiser Aluminum conductor.



R. C. VIRGIN, Superintendent of Transmission and Distribution, inspects Kaiser Aluminum triplex which is used extensively for services in fast-growing Key West.



NEW HOUSING DEVELOPMENT in booming Key West is built on man-made fill extending into the Gulf of Mexico. All conductor is aluminum.

ACSR LINE feeds new shrimp dock and basin (shown under construction). This is now one of the nation's largest shrimp docks. Some 400 shrimp trawlers operate from the area.

SALT-LADEN KEY WEST "HAS NO PROBLEMS" WITH KAISER ALUMINUM WIRE!

Key West Electric successfully uses Kaiser Aluminum conductor in salty atmosphere for economy and good service

THE City of Key West Electric System—entirely surrounded by salt-water—today uses *only aluminum* conductor for its bare primaries, secondaries and service drops.

According to Mr. M. E. Rosam, Manager, "In spite of our heavy salt-water atmosphere, we have experienced no trouble with Kaiser Aluminum conductor.

"There is no secret to our success with aluminum in this area. We simply follow the best aluminum-handling practices and employ aluminum connectors that have proved reliable under our conditions. We make a simple field treatment with an oxide inhibitor.

"We get gusts of wind up to 75 mph on this island—yet we've never had a failure with Kaiser Aluminum triplex.

"In all phases of our construction, Kaiser Aluminum engineers have given us invaluable assistance."

Growth of Key West Electric

During the last 10 years, Key West population has tripled. And the progressive Key West Electric System has kept the pace with major expansions.

Extensions of the original system include service to the Boca Chica Air Base on Boca Chica Key, and to customers located on adjacent Stock Island. Service also has been extended to major housing developments, and to the Lower Keys as far as Big Pine Key. This 13.8 kv line is approximately 30 miles long and serves about 275 customers.

The entire Key West Electric System now serves more than 9,500 customers.

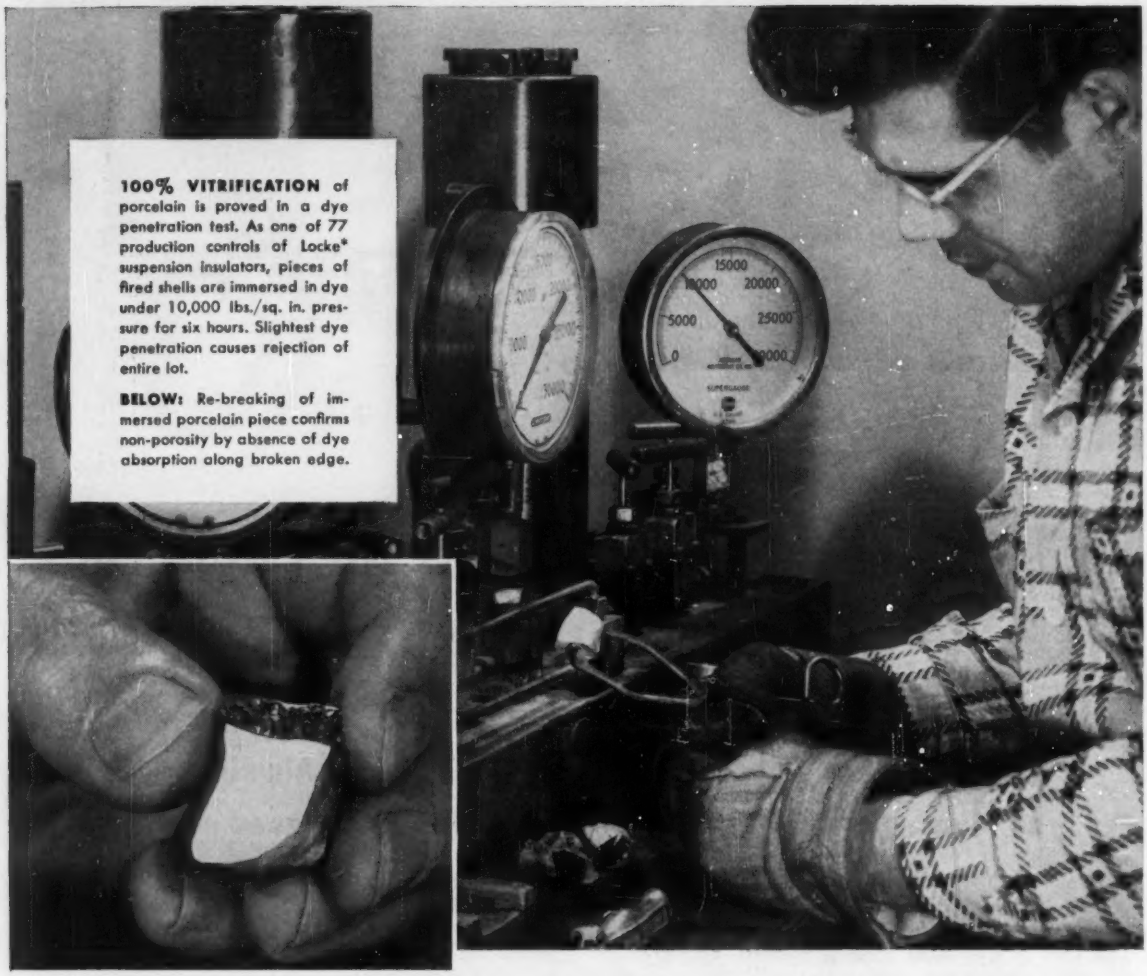
K/W service available to you

During the rapid expansion of the electrical industry, Kaiser Aluminum has concentrated intensively on utility problems, with emphasis on covered wire. Today, Kaiser Aluminum is the nation's fastest growing producer of aluminum wire and cable, making available the latest helpful information on modern products and practices.

A Kaiser Aluminum representative or a K/W distributor will give you immediate attention. Contact your Kaiser Aluminum sales office. Kaiser Aluminum & Chemical Sales, Inc., *Executive Office*, Kaiser Building, Oakland 12, California; *General Sales Office*, Palmolive Building, Chicago 11, Illinois.

Kaiser Aluminum

Aluminum is the answer to Adequate Wiring



100% VITRIFICATION of porcelain is proved in a dye penetration test. As one of 77 production controls of Locke* suspension insulators, pieces of fired shells are immersed in dye under 10,000 lbs./sq. in. pressure for six hours. Slightest dye penetration causes rejection of entire lot.

BELOW: Re-breaking of immersed porcelain piece confirms non-porosity by absence of dye absorption along broken edge.

How good can an insulator be?

CONSIDER THESE TESTS OF

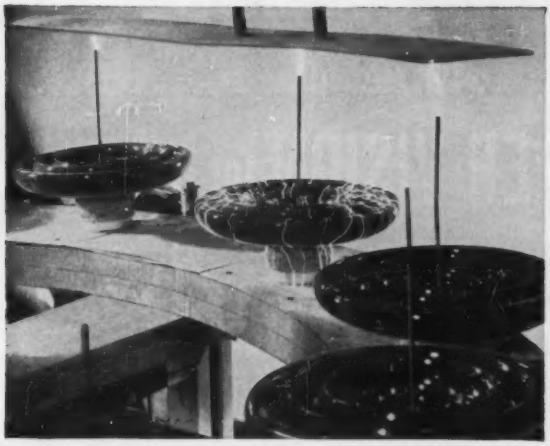
Satisfactory micro-structure of the fired insulator shell, assuring mechanical and electrical soundness, is an absolute *must* before it is allowed to become part of an insulator for your lines.

While the completed porcelain may appear solid, smooth and uniform at an outward glance, only close microscopic examination and other tests can prove it homogeneous, non-porous and properly glazed. Porcelain must be completely vitrified. For satisfactory composition, density must be uniform and within narrow limits.

Glaze must be of prescribed thickness to obtain maximum mechanical strength. The procedures shown above are individually scheduled as dictated by sound engineering judgment. They are your assurance of the dependability of each Locke insulator.

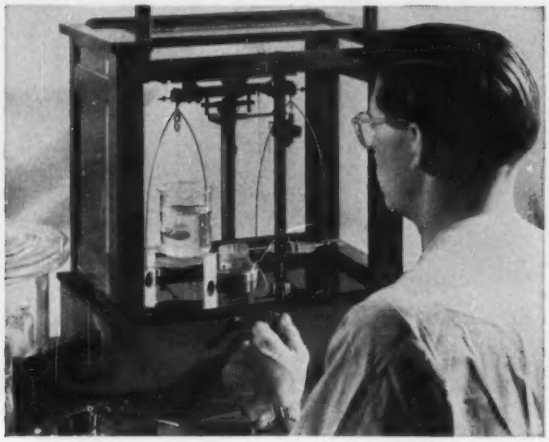
The case of Fired Porcelain "Quality Control" is typical of the extremes to which General Electric goes to assure trouble-free service on your system.

For a brief and complete picture story of insulator quality control, simply ask your General Electric Insulator representative or write to Insulator Department, General Electric Company, P. O. Box 57, Baltimore, Maryland.



FIRST ELECTRICAL TEST of porcelain shells follows firing. Moving on a conveyor, they must withstand a 3- to 5-second flashover test at about 200 kilocycles without puncture.

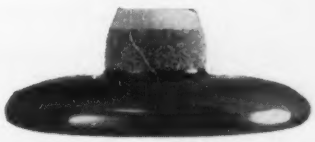
EXACT GLAZE THICKNESS, vital to the mechanical and electrical strength of the finished MICROGLAZE* insulator, is accurately determined by microscopic measurement.



FIRED DENSITY TEST—As the specific gravity of properly vitrified porcelain falls within a very narrow range, it is possible through this test to detect very small deviations from satisfactory composition.

TISSUE THIN PORCELAIN sections, when examined through a petrographic microscope, reveal their crystalline structure and state of maturity.

FIRED PORCELAIN



Progress Is Our Most Important Product

GENERAL ELECTRIC

*Trademark of General Electric Company

PHILCO INDUSTRIAL TELEVISION

Clearest Picture on the Industrial Scene!

With new advanced circuitry plus aluminized picture tube, Philco Industrial TV produces pictures of unmatched clarity and sharpness . . . maximum contrast and brightness. Now you see all the details . . . all the time. Dangerous operations can be controlled from a safe vantage point; efficiency can be kept at peak levels; troubles can be seen when they start . . . tie-ups avoided . . . downtime minimized. Dollar for dollar, Philco Industrial TV is the most reliable and versatile tool that you can add to your supervisory staff.

- **Horizontal Resolution up to 600 Lines . . . produces studio quality pictures.**
- **High Definition Picture at Low Light Levels . . . does not require brilliant illumination for sharp detail.**
- **Economical System Expansion . . . once installed, additions to a system can be made easily and at low cost.**
- **Full Remote Control . . . camera can be tilted, panned, focused, or zoomed in for closeups from one central control location.**
- **Choice of Monitor Size and Mounting . . . 10 inch or 17 inch . . . wall mounted, rack mounted, or installed in a console.**

Write to Dept. EW for full information

PHILCO CORPORATION

GOVERNMENT AND INDUSTRIAL DIVISION • PHILADELPHIA 44 PENNSYLVANIA

In Canada: Philco Corporation of Canada Limited, Don Mills, Ontario

A DAY THAT NEVER ENDS

For this efficient plant the workday goes on around the clock—a year-in, year-out performance as dependable as the public service rendered by America's privately owned power companies. It is the 320,000 kilowatt El Segundo station, newest in the Southern California Edison system. More than 1 million kilowatts of new steam-electric generating capacity from highly efficient plants like El Segundo helps Edison meet a tremendous demand growth while retaining rate schedules that are among the lowest in the country.

Bechtel was responsible for engineering design and construction, working closely with the Edison staff, as it has for many years on a variety of projects.

BECHTEL

BECHTEL CORPORATION

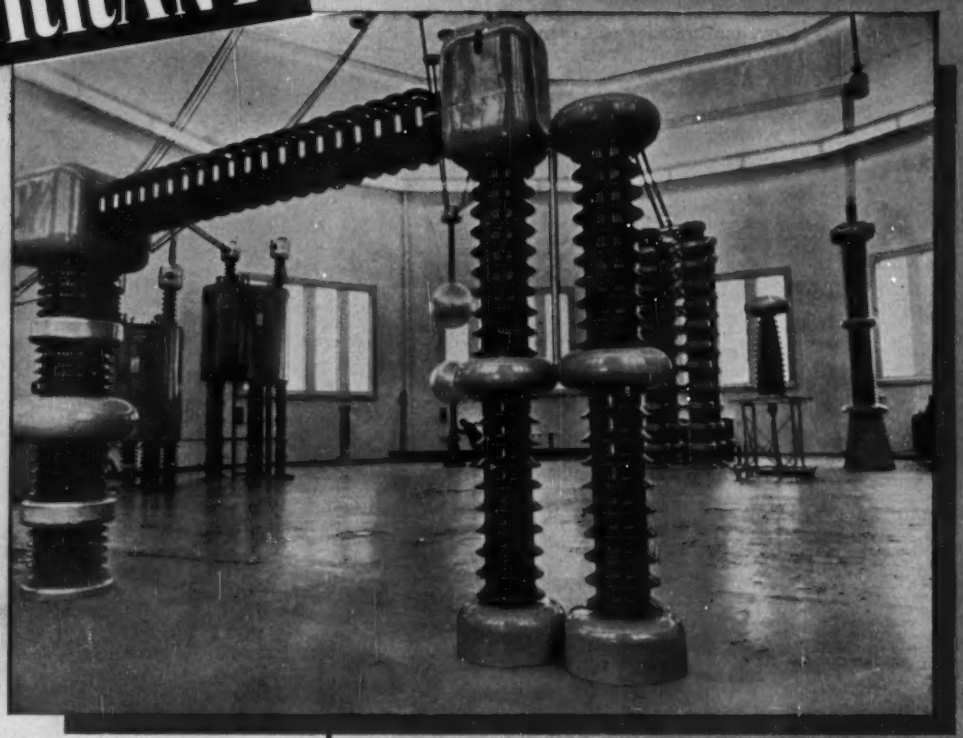
BUILDERS FOR INDUSTRY

Los Angeles • SAN FRANCISCO • New York

CANADIAN BECHTEL LIMITED • *Toronto* • *Vancouver*

FERRANTI

HIGH VOLTAGE TESTING EQUIPMENT



IN NORWAY

The Testing Equipment illustrated has been supplied by Ferranti Ltd to the Research Laboratory of Standard Telefon og Kabelfabrik A/S, Oslo, Norway. It consists of :

Foreground : 1,000,000 volt D.C. Testing Equipment.

Left . 600 kV, 1,200 kVA, A.C. Testing Equipment.

Background : 12 Stage 2,000,000 volt Impulse Generator.

A 1,500 mm sphere gap and surge potentiometer can also be seen in the background.

F FERRANTI

TRANSFORMER CAPACITY OF OVER 5,000,000 kVA PER ANNUM

The Ferranti transformer plant at Hollinwood, Lancashire, England, covering an area of over 300,000 sq. ft. has a manufacturing capacity per annum of over 5,000,000 kVA of Large Power Transformers, Distribution Transformers, Voltage Regulators, High Voltage A.C., D.C., and Impulse Testing Plant and Specialised Equipment. Contracts include the supply of transformers for the Garrison Dam and McNary Dam Projects in the U.S.A. and the Alcan Project in Canada.

FERRANTI LTD. Head Office and Plant : HOLLINWOOD · LANCASHIRE · ENGLAND

PLANTS AND OFFICES

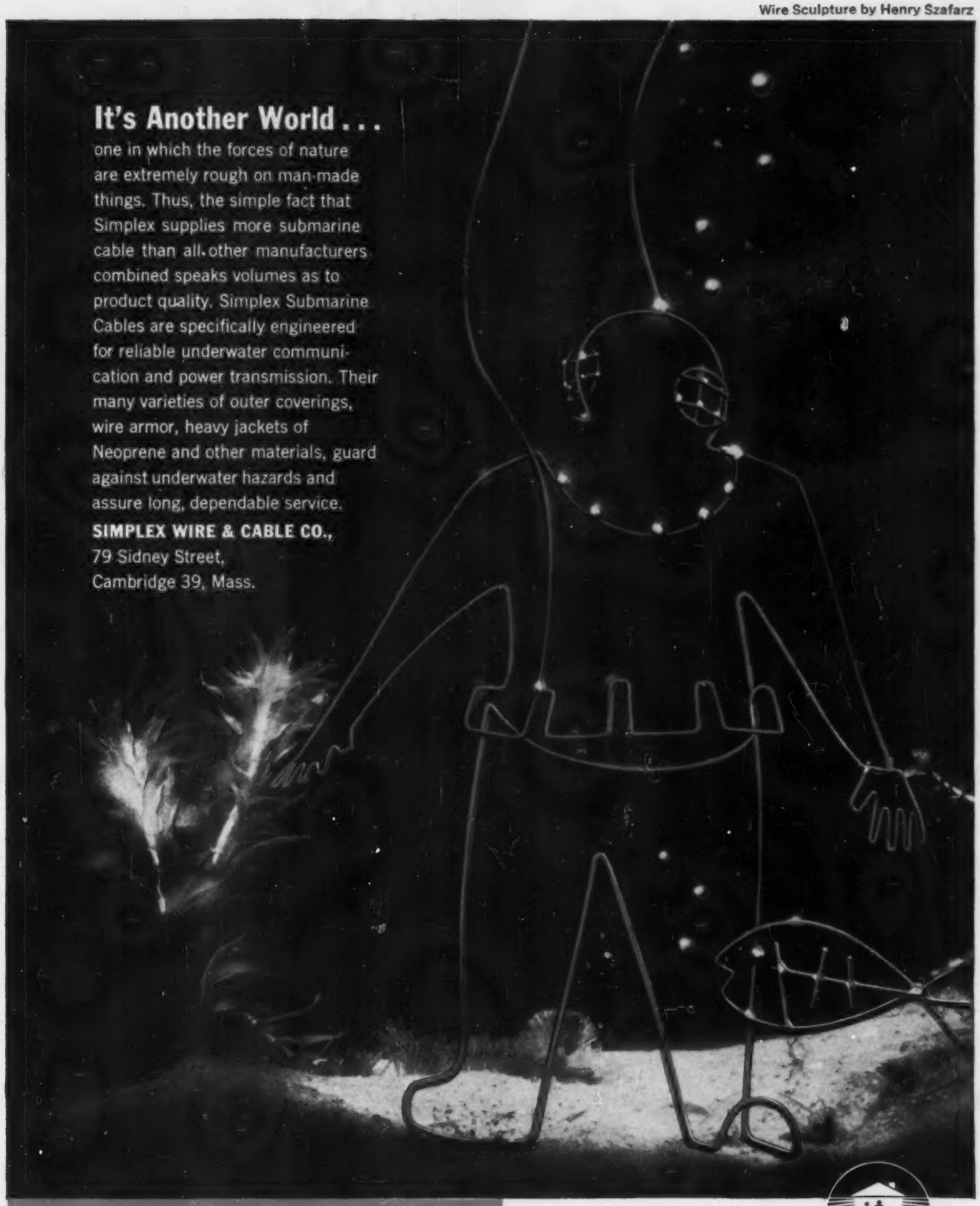
NEW YORK : Ferranti Electric Inc., 30 Rockefeller Plaza, New York 20, N.Y.

TORONTO : Ferranti Electric Ltd., Mount Dennis, Toronto 15, Ontario.

MANCHESTER, ENGLAND : Ferranti Ltd. Moston, Manchester 10.

EDINBURGH, SCOTLAND : Ferranti Ltd., Ferry Road, Edinburgh 5.

Wire Sculpture by Henry Szafarz



It's Another World . . .

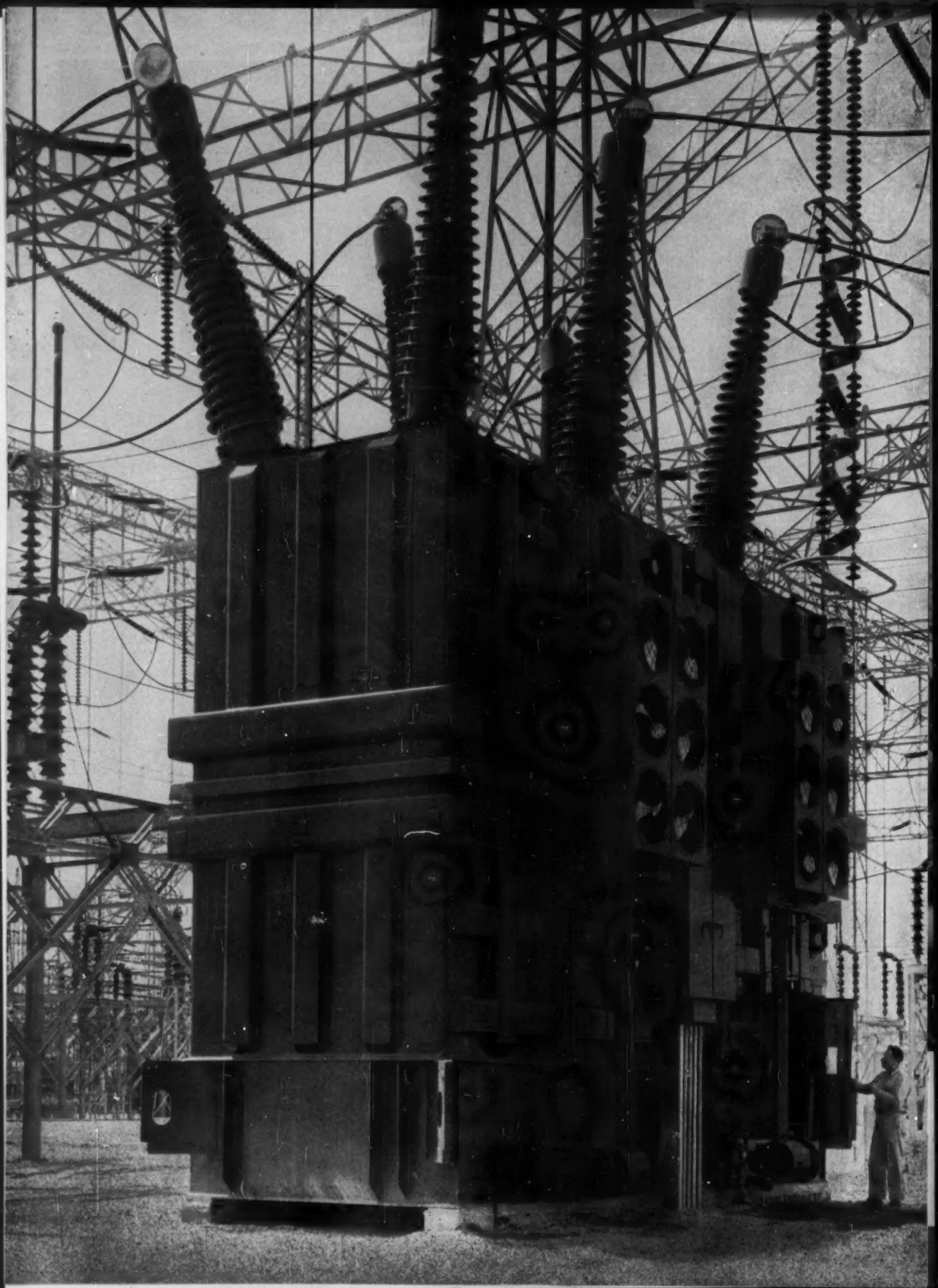
one in which the forces of nature are extremely rough on man-made things. Thus, the simple fact that Simplex supplies more submarine cable than all other manufacturers combined speaks volumes as to product quality. Simplex Submarine Cables are specifically engineered for reliable underwater communication and power transmission. Their many varieties of outer coverings, wire armor, heavy jackets of Neoprene and other materials, guard against underwater hazards and assure long, dependable service.

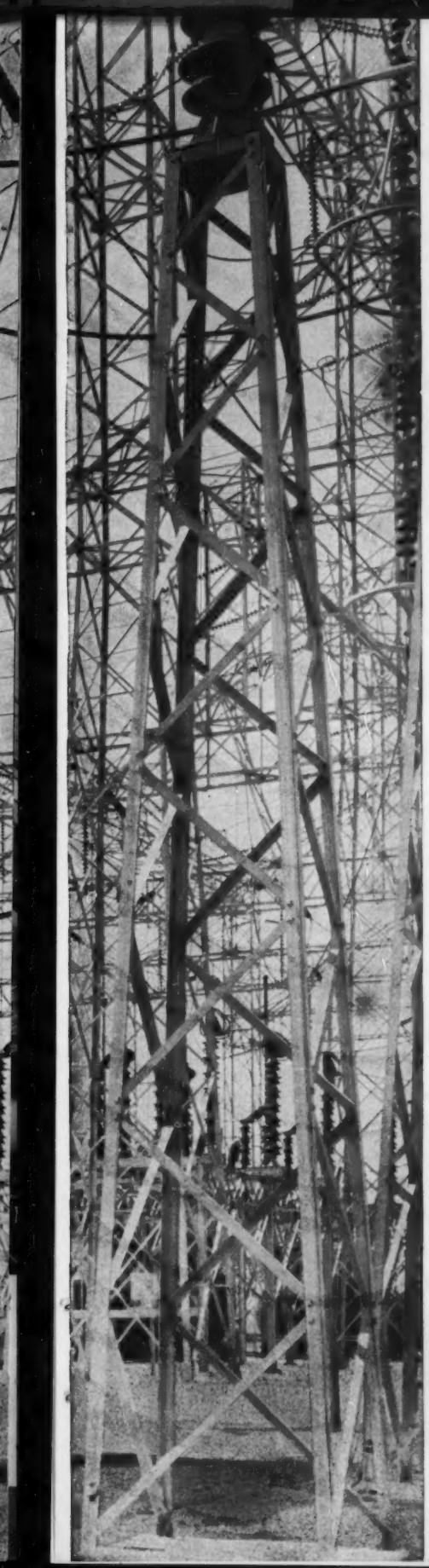
SIMPLEX WIRE & CABLE CO.,
79 Sidney Street,
Cambridge 39, Mass.

Photo of Transoceanic Telephone Cable, Cut Back to Show Construction

LIVE BETTER ELECTRICALLY

Simplex





World's largest at 400,000 kva...

greatest transformer capacity ever applied to a transmission system

News was made recently with the installation of the world's largest autotransformer at the Tanners Creek plant of the Indiana & Michigan Electric Co., Lawrenceburg, Indiana. This 330-kv unit and another identical twin, both built by Westinghouse, are the only transformers of this enormous capacity ever operated on a transmission system.

One glance will show you the giant proportions of this transformer compared with the man in the foreground—33 feet high from base to bushing tip, 30 feet long, 16 feet wide, and weighing 574,000 pounds oil-filled. Despite the literal immensity of the transformer, it is the Westinghouse Form-Fit design with forced-oil cooling which made it practical to construct and ship this 3-phase unit—a new achievement in power conversion for the electric utility industry.

With the development of this new capability in transformers, it is still a fact that Westinghouse Form-Fit transformer design provides minimum bulk consistent with low losses, offering you maximum year-in and year-out operating economy and over-all performance you can depend on.

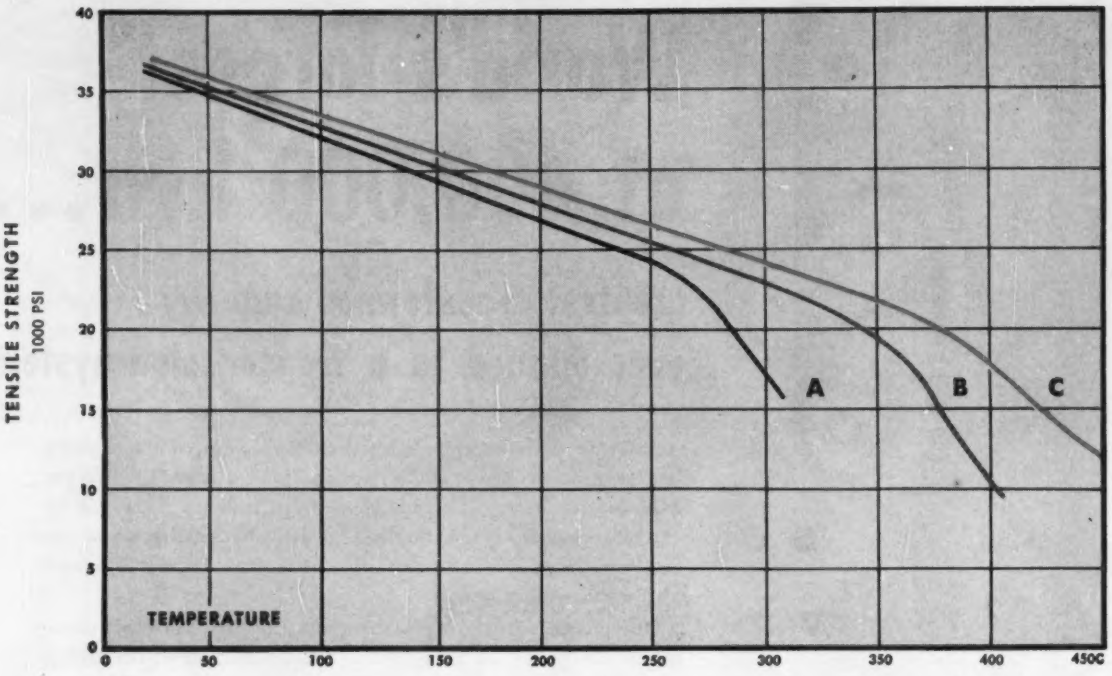
For more particulars, get in touch with your Westinghouse Sales Engineer, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-70756

The greatest concentration of power conversion equipment ever applied to a 330-kv system is shown here at the Tanners Creek plant of the Indiana & Michigan Electric Co.

YOU CAN BE SURE...IF IT'S

Westinghouse

How silver helps copper conductors at elevated temperatures



THE INFLUENCE of silver on the tensile properties of high-conductivity copper at elevated temperatures. Tests made by the Metallurgical Research Laboratory of The American Brass Company. The test pieces were copper strips, cold-rolled to a temper approximately that of hard-drawn rectangular bus bar.
A. Electrolytic copper, silver content normal
B. Electrolytic copper, silver 8.7 ounces per ton added
C. Electrolytic copper, silver 28 ounces per ton added

In heavily loaded motors and generators, the windings, collector rings, and commutators must retain their strength at the higher operating temperatures that have become the rule. And there are now many other places where copper conductors must operate at temperatures well above those heretofore considered normal.

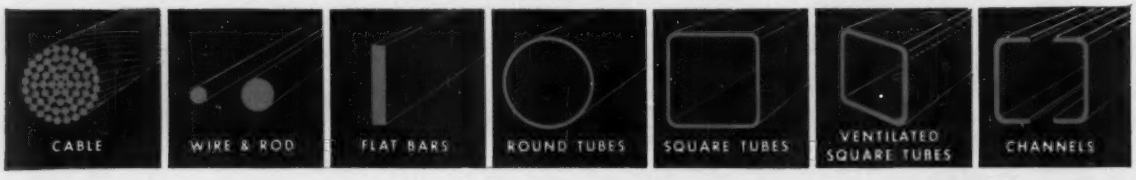
Electrolytic copper—with a very small amount of silver added—is superior to any other commercial conductor metal for use at these higher temperatures. Anaconda silver-bearing copper retains the structural design strength of the conductor at the higher operating temperatures. Annealing temperature is raised and softening delayed. The margin of safety is improved. How much gain you can count on is indicated by the chart above.

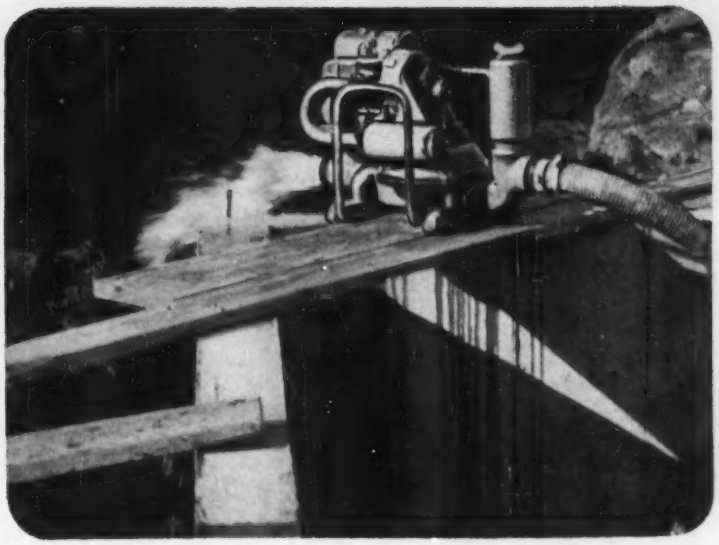
More complete information is available in the brand-new Fifth Edition of The American Brass Company's Publication C-25, "Anaconda Copper for Electrical Conductors." In addition, this 62-page booklet has convenient new tables giving physical and electrical data on all types of rigid bus conductors for the most commonly used sizes—plus a wealth of general information on the properties of copper conductors.

TECHNICAL SERVICE. The assistance of Anaconda specialists in the selection of conductors to meet your special problems is available to you. For such assistance — or to get a copy of "Anaconda Copper for Electrical Conductors" — see your nearby Anaconda representative. Or write: The American Brass Company, Waterbury 20, Conn. 86100

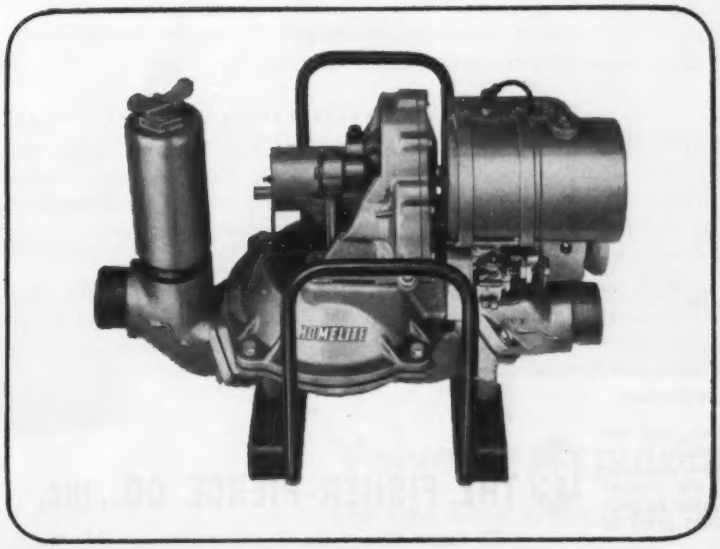
ANACONDA® COPPER CONDUCTORS

THERE'S AN ANACONDA ELECTRICAL CONDUCTOR FOR EVERY NEED





It's here!
The new heavy-duty diaphragm pump that's light enough to carry



Here's the diaphragm pump that goes most easily to the job and does more when it gets there. Specifically designed for continuous, heavy-duty work, this Homelite pump will dewater an area at a 5000 g.p.h. clip, then keep right on going to handle seepage in the thickest mud, muck and sand. Yet, because it weighs only 120 pounds, it gets to the job fast . . . even over the roughest terrain.

The entire unit is built for long, trouble-free operation. Manual throttle control adjusts engine speed for full-capacity pumping or handling small seepage flow . . . gives greater fuel economy and prolongs engine life. Ball and roller bearings protect engine and pump from excessive wear. Totally enclosed reduction gears run in oil. Tough, oil-resistant diaphragm can be easily replaced in ten minutes right on the job.

For more information or a demonstration on your job, write or call your nearest Homelite representative.

NEW HOMELITE
Carryable
DIAPHRAGM PUMP

Model 20DP3-1 has guaranteed total lift up to 28′ and total head up to 50′, including friction.

HOMELITE

A DIVISION OF TEXTRON INC.
6109 RIVERDALE AVENUE
PORT CHESTER, NEW YORK

design advantages

OF FISHER-PIERCE

PHOTOELECTRIC LIGHTING CONTROLS

Any utility field man who has installed a Fisher-Pierce photoelectric control knows firsthand the many advantages of its clean, straightforward design. He appreciates, for example, time-saving plug-in installation of the one-piece electronic head; the ease, speed and safety with which he can handle compact F-P controls; the clean meter plate that has nothing to interfere with external wiring; the easily checked fuse. He knows the weatherproof glass enclosure design gives him quick, easy access to the control chassis; that he can orient an F-P control after mounting; and that component layout permits trouble-free servicing as well as maximum impulse strength. These advantages are important to the utility itself as well as the field man, since they mean rapid, low-cost installation and substantially reduced maintenance. Only F-P controls provide these advantages, *plus* these four other important features:

Series 64400

Series 63300C

COMPONENT QUALITY — Pre-aged, long life tubes • Wire wound potentiometer • Metal encased capacitors • Non-hygroscopic 1P39 phototube • Balanced armature Sigma sensitive relay.

PROTECTION — From surges and lightning, by linen-based bakelite sub-mounting chassis and proper component spacing Circuit and load fuses, and lightning arrestor • Fail-safe operation.

ADAPTABILITY — Three basic series and numerous models for all mounting requirements, operating voltages, load capacities and desired contact arrangements.

DEPENDABILITY — Proven by the thousands of F-P controls used by hundreds of utilities, over the past ten years.

Complete specifications and operating data are contained in informative F-P Bulletins, available on request. Or call the Fisher-Pierce sales representative in your area, for point-by-point proof of F-P superiority.

THE FISHER-PIERCE CO., INC.

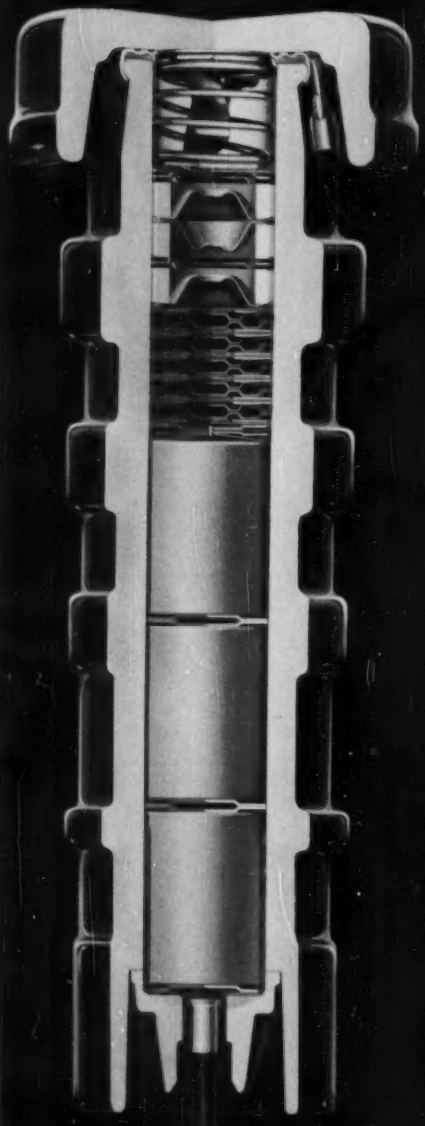
82 Pearl Street, So. Braintree, Boston 85, Mass.

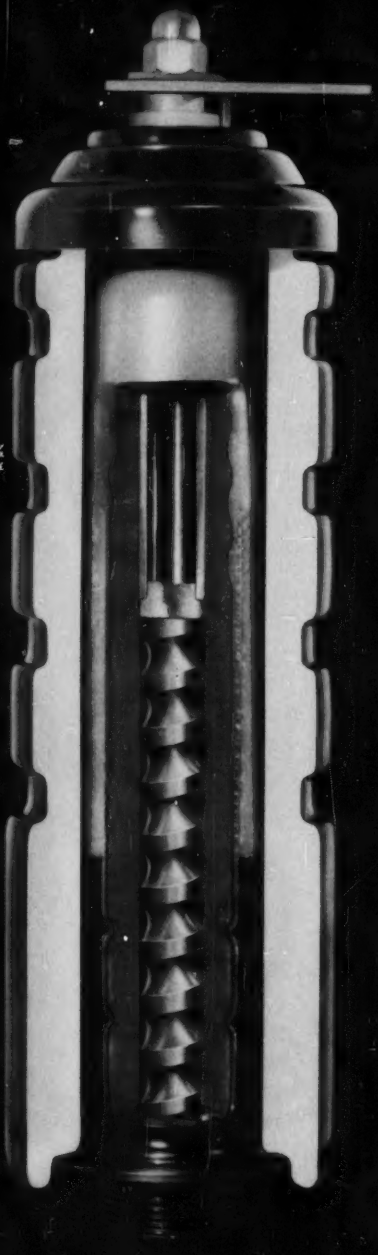
Valve or expulsion arresters?

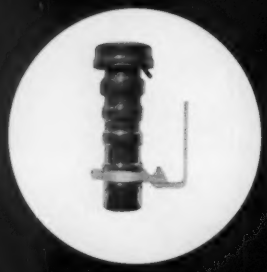
The two basic types cover all applications

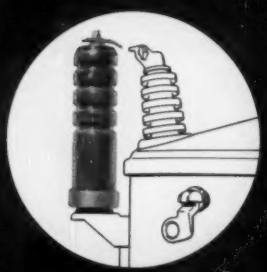
WATCH WESTINGHOUSE!

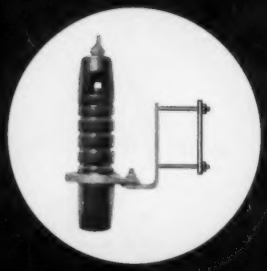
*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

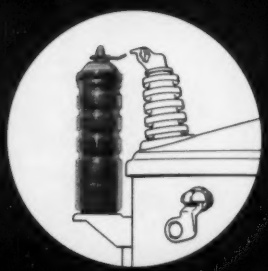












LV

LVT

VALVE

LX

LXT

EXPULSION

Valve or Expulsion...

Only Westinghouse is in the unique position of having a complete line of both types—each having outstanding performance.

There is *no real controversy* over valve versus expulsion arresters . . . *if* the basic design of both is sound.

Westinghouse was the originator of both types: Valve type invented by Dr. Slepian in 1922; expulsion, by Torok in 1933. Improvements by Westinghouse in both designs have been continuous, keeping pace with the "stiffening" requirements of distribution systems, until today both Westinghouse arresters are evaluated as providing equal lightning protection.

The following explains why . . .

LIFE . . .

Confused claims of superior life expectancy for either type are misleading. The life expectancy of a Westinghouse design, valve or expulsion, averages well beyond that of any transformer it may be installed on to protect. Field records on CSP® transformers indicate 26 million arrester years of service with less than .026% failure rate.

APPLICATION . . .

How close to a substation they may be installed is never a problem with either Westinghouse arrester. Autovalve® blocks have such inherent resistance at line-to-ground voltage that "follow current" is low in value. Westinghouse expulsion arresters likewise limit follow current to only a few hundred amperes. The unique spiral groove and molded jacket design provide the most effective current-limiting expulsion arrester available today.

DIRECT STROKES . . .

Both Westinghouse valve and expulsion arresters not only meet the industry standards of 65,000 surge-amperes, but have been tested well in excess of this level. For example, 9-kv arresters, both types, have successfully discharged currents in excess of 100,000 amperes.

PROTECTIVE CHARACTERISTICS . . .

Impulse spark over is safely below the insulation level of the transformer protected. Yet the 60-cycle spark-over levels of both Westinghouse designs are high enough that harmless switching surges will not cause arrester operation. No other designs achieve this unique and exclusive balance . . . an engineering decision reached by Westinghouse, based on more years of arrester experience in the field than any other manufacturer.

FUSE COORDINATION . . .

Both Westinghouse valve and expulsion arresters limit follow current to less than a half cycle. Since coordination between transformer and sectionalizing fuses requires more than a half cycle, Westinghouse arresters do not enter into this problem.

SERVICE RECORD . . .

Westinghouse, with more arresters in service today than any other manufacturer . . . of both types . . . computes a better than 99.974% perfect service record.

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

Westinghouse recommends

expulsion (LX-T) arresters for CSP transformers

because . . .

APPLICATION

The arrester application problems such as: spark-over voltage, surge-current ability, discharge voltage, 60-cycle short-circuit capacity and arrester life become the primary responsibility of the manufacturer when a coordinated CSP packaged unit is purchased. The Westinghouse expulsion arrester has all the desirable characteristics which are needed to protect the transformer and the system.

FIELD RECORD

Since the introduction of the CSP transformer, over 1.5 million Westinghouse CSP's with expulsion arresters have been installed. The field record of these units indicates over 26 million arrester years of service with a failure rate of less than .026%.

STANDARDIZATION

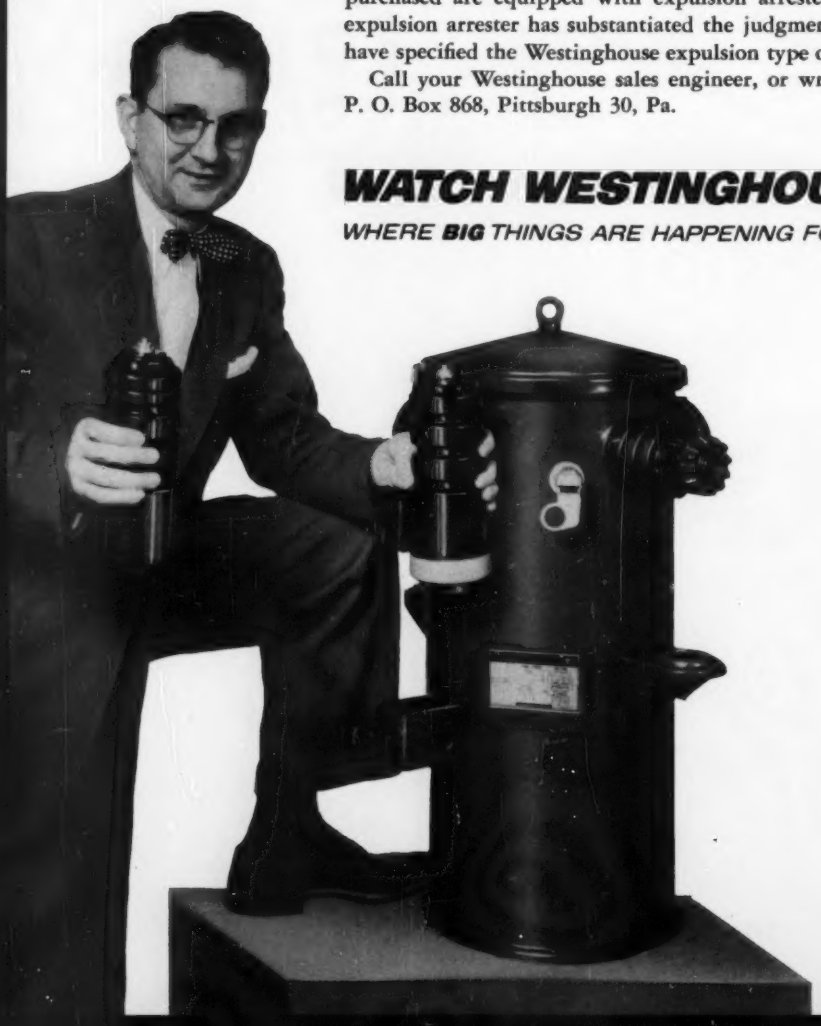
It makes sense to standardize on an arrester with proved superior performance — to help utilities reduce ordering problems and improve service through this standardization.

Today after 23 years of experience, 97% of Westinghouse CSP transformers purchased are equipped with expulsion arresters. The compiled record of the expulsion arrester has substantiated the judgment of those utility engineers who have specified the Westinghouse expulsion type on CSP's.

Call your Westinghouse sales engineer, or write Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. J-70771

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

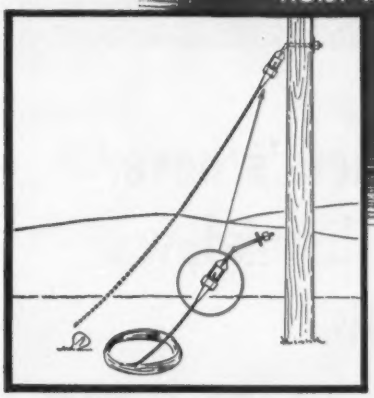


Complete a down-guy IN 5 MINUTES?

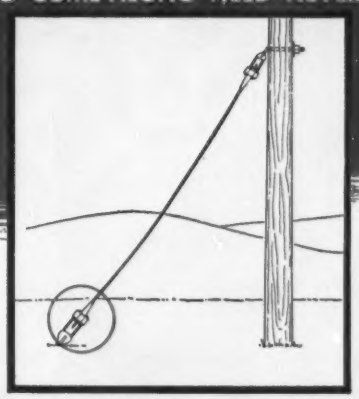
We'll bet your man can do it with . . . STRANDVISE®

Don't take that bet until you've had some of your men try this sure, simple, easy way to install down-guys — we'll even bet that you'll be boasting that some of them can do it in less than five minutes.

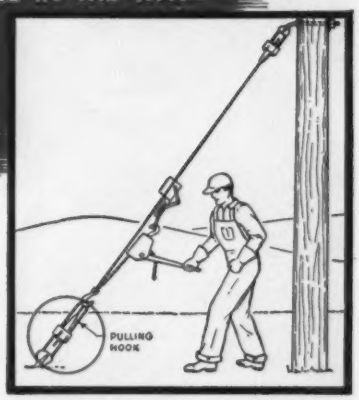
FOLLOW THESE THREE EASY STEPS:
HOIST AND COME-ALONG NEED NEVER BE IN THE WAY



STEP 1 Assemble STRANDVISE to pole-top hardware and complete pole-top installation. Do not cut strand from coil; it is usually wasteful.



STEP 2 Assemble STRANDVISE to anchor eye. Measure strand hand-tight to lower end of STRANDVISE, then cut. Insert strand and feed through STRANDVISE, just hand-tight.



STEP 3 Now place come-along and hoist and apply tension. It's just as easy for double or triple guys as it is for singles.

NOW STEP BACK, THE JOB IS DONE . . .
IT'S JUST THAT SIMPLE

And here's a new pulling hook that makes the job even easier, although a pulling hook isn't needed if anchor rod will take a come-along.

Have some of your men try the Reliable STRANDVISE for easy five minute down-guy installations . . . we'll gladly supply samples for the test.

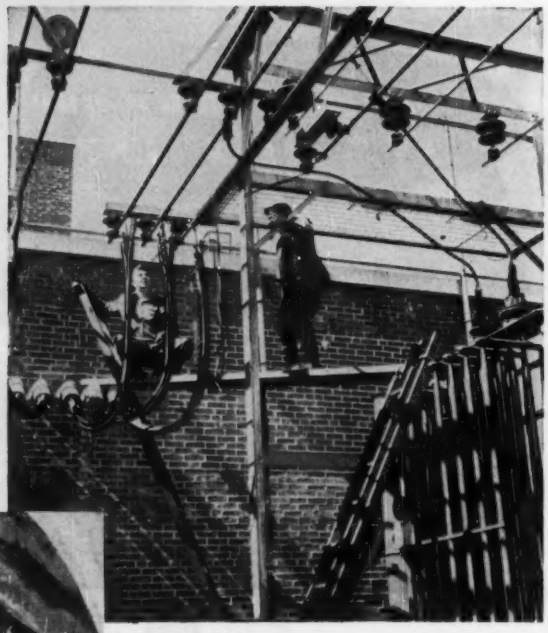
STRANDVISE — available for 3/8" through 7/16" strand, all grades. Stainless steel (rigid) and galvanized steel (flexible) bails for all types of guy attachments.

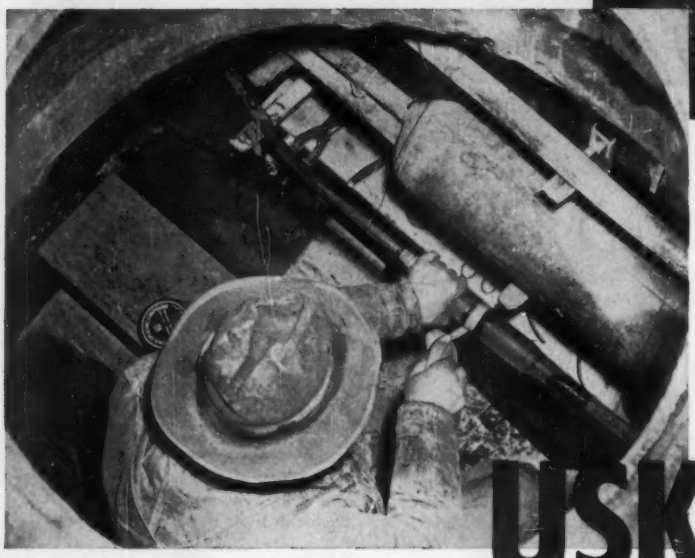
Reliable POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

ELECTRIC COMPANY 8145 CARROLL AVENUE CHICAGO 12, ILLINOIS

OVER 45 YEARS OF SERVICE TO THE UTILITIES

Overhead or Underground





There's never a breakdown with USKORONA tape

On splicing or terminating electrical cables on underground power lines, street lighting circuits and transformer leads, on secondary network systems—to name just a few—Uskorona tape is *essential* because it is the only tape that is resistant to both ozone and moisture. It fuses with and becomes a part of the insulation and gives the same dielectric strength as the original insulation. Naturally, it exceeds A.S.T.M. specifications.

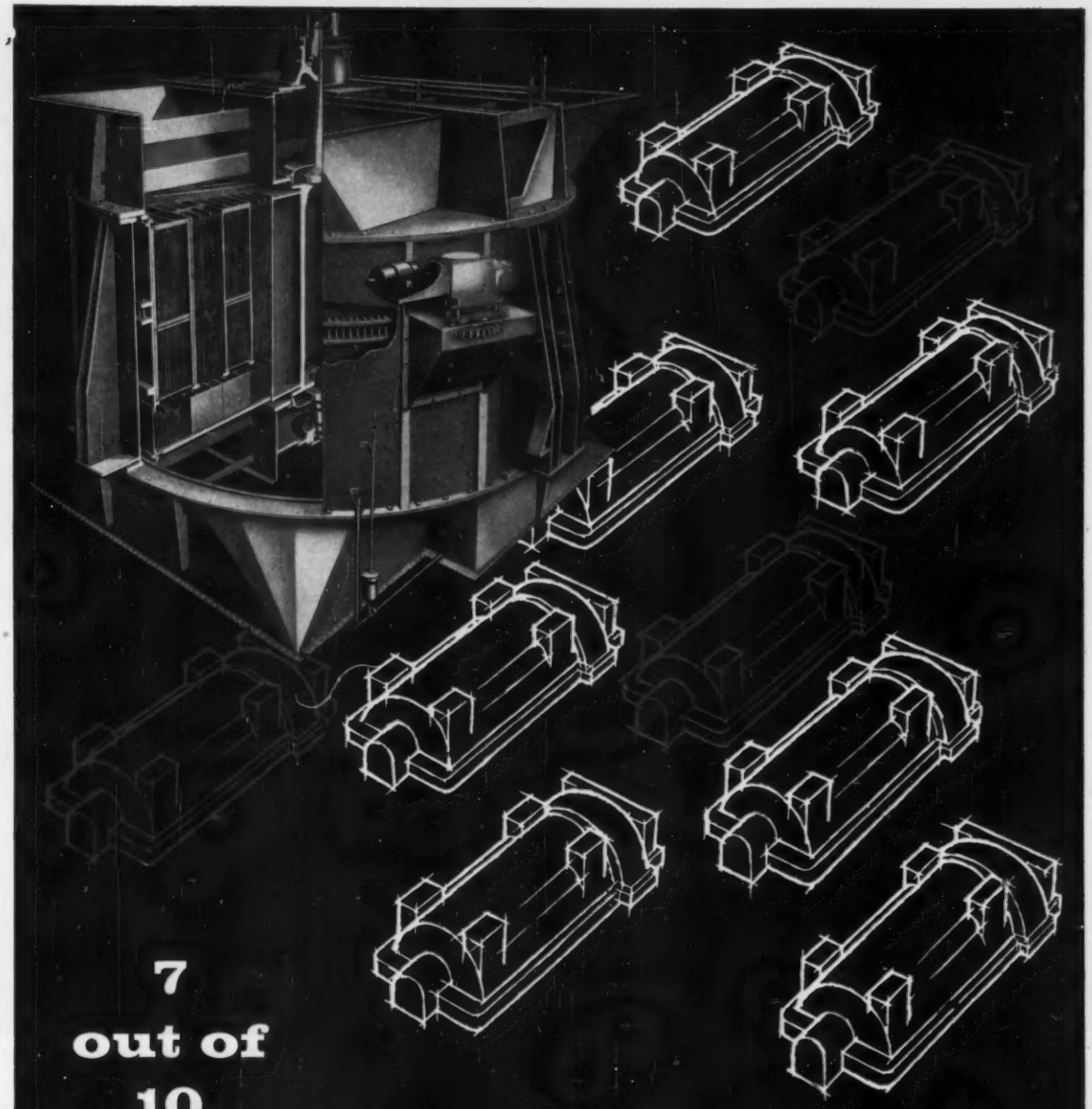
Uskorona® was developed to assure ozone and moisture protection to high voltage lines. Here's how good Uskorona is:

- In a corona-(ozone) resistance test of 4 leading brands, Uskorona was the only tape still intact after 4 hours of exposure.
- Even after 1500 additional hours of continuous exposure, Uskorona remained as fresh and corona-resistant as at the start.

Obtainable at any of our numerous distributors, any of the 28 "U. S." District Sales Offices, or write us at Rockefeller Center, New York 20, N. Y.

Mechanical Goods Division

United States Rubber



7 out of 10

air preheater installations are Ljungstrom®

Advantages of the Ljungstrom Air Preheater

- Size for size, recovers far more heat than any other type.
- Reduces fuel consumption. Permits use of lower grade fuels. Increases boiler output and reliability.
- Eliminates cold spots . . . keeps corrosion to a minimum.
- Easier, faster to clean and maintain.
- Requires far less supporting steel and is quickly erected.

MINIMUM MAINTENANCE is one of the many important reasons. More complete combustion of fuel results in far less slagging, and gases entering dust-recovery units are cleaner. There's less corrosion. Insertion of new elements can be done in as short a time as four hours. You can even inspect the Ljungstrom through a built-in port while the unit is in operation.

For the interesting full story, send for a free copy of our 38-page manual.

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

YOU GET

LONG-LASTING PROTECTION FOR YOUR OVERHEAD SYSTEM

with

BLACKBURN *Grounding* DEVICES

Type GTC 1
One plate tower ground clamp

Type GTC 2
Two plate tower ground clamp

Copper Bonded Pigtail

Type GUV
U-bolt ground clamp parallel or 90°

Steel Driving Stud for Sectional Ground Rods

Type GG
Ground Rod Clamp
Socket set screw

Copper Alloy Coupling for Sectional Ground Rods

Copper Bonded Sectional Ground Rods

Copper Bonded Regular Ground Rods

Type GGH
Ground Rod Clamp
Square head bolt

Type B
Budget Line Ground Rod Clamp
Square head bolt

Type GP 100
Electrolytic Copper Pole Bottom Plates
7½", 10", 14" dia.

Blackburn grounding devices will save you thousands of dollars annually in preventing burnouts of expensive overhead equipment. This complete line simplifies your stocking problem—one source for all your needs. Like all BLACKBURN products they are constructed of high-strength corrosion resistant materials—designed for easy installation and engineered for long-lasting, trouble-free grounding. Always specify BLACKBURN.

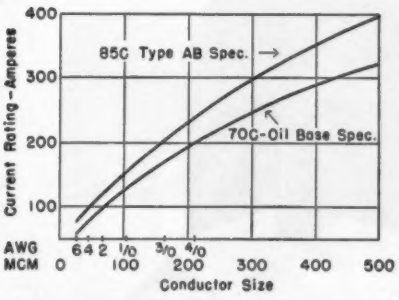
Available Through Electrical Wholesalers Everywhere

DISTRIBUTED ON THE WEST COAST BY
KORTICK MFG. CO.

JASPER BLACKBURN CORPORATION
ST. LOUIS 6, MO.
35 Madison Street — Phone MAin 1-2821

Greater current-carrying capacity of Type AB butyl high-voltage cable helps users cut costs, use new or existing facilities more efficiently.

Cable that takes the squeeze out of crowded conduits



85C OPERATING TEMPERATURE rating of Anaconda Type AB cable affords 22% more current-carrying capacity than 70C rated materials, when installed in conduit at 40°C ambient temperature.

Now you can obtain the same amount of current with a smaller cable... or more current with the same size cable—with Anaconda's Type AB butyl high-voltage insulation.

For Anaconda Type AB butyl-insulated cable is recommended for operation at *85C operating temperature.* Industry specifications recommend 70C for oil-base insulations. Thus, as the curves on the chart show, Type AB delivers 22% more current-carrying capacity . . . and more amps per dollar.

New Engineering Bulletin EB-27 gives you full details on performance of Type AB insulation in 15 Industry Specification Tests. Ask the Man from Anaconda for your copy. Or write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

56295 Rev.

SEE THE MAN FROM ANACONDA®

—pioneer in BUTYL INSULATION

Advanced Design

Means: Reduced Weight / Easier Handling / Versatile Installation

Advanced design features make these Allis-Chalmers potential transformers smaller and lighter than ever before. This reduction in size and weight results in space-saving transformers that are easier to handle and simpler to install.

NEW compact design also results in improved performance in both ratio and phase angle.

NEW potential transformer ratings have been added to include higher voltage classes.

Best of all, with these smaller, lighter units, you still get all the maintenance-cutting, long-term economy features you expect from Allis-Chalmers.

ALLIS-CHALMERS Potential Transformers

POTENTIAL			
Two-Bushing Transformer			
TYPE	Insulation Class	Height	Weight
SPW-2	25	38½	280
SPW-3	34.5	40½	310
SPW-4	46	48½	615
SPW-6	69	61	1160
SPW-11	115	86	3400
Single-Bushing Transformer			
SPW-21	25	41	260
SPW-31	34.5	44¼	285
SPW-41	46	50¾	460
SPW-61	69	63¾	950
SPW-111	115	92	2310
SPW-131	138	112	3510

Get all the information on these modern lightweight transformers. Contact your nearby A-C district office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

LIVE BETTER ELECTRICALLY

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-5125

Stringing 62 miles of second circuit on same tower with *LIVE* 330,000 volt line

ANOTHER SUCCESSFUL HOOSIER ENGINEERING FIRST

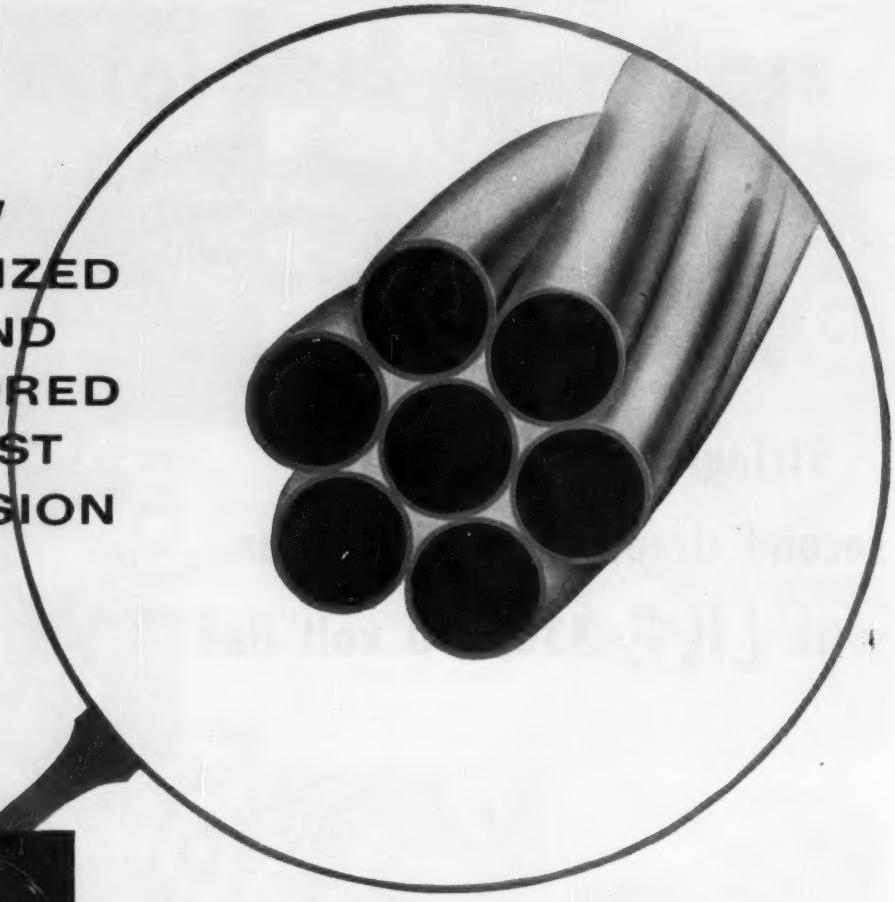
This recent installation presented a real challenge. Originally built by Hoosier in 1952, the increased demand on this West Virginia line required stringing a second circuit . . . without interruption of the first circuit. Hoosier Engineers developed special equipment for tension stringing . . . and for the first time in power history successfully installed a second circuit on an existing line while the first circuit was energized and working at 330,000 volts.

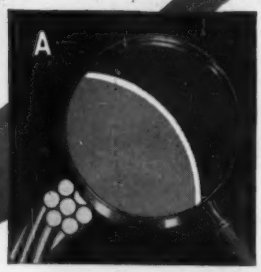
HOOSIER *Engineering Company*

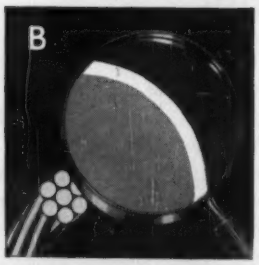
1384 HOLLY AVENUE • COLUMBUS 16, OHIO

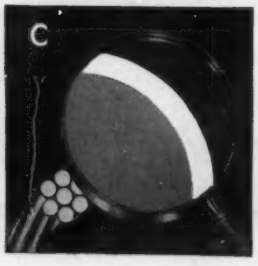
ERECTION AND MAINTENANCE OF TRANSMISSION LINES

HOW BETHANIZED STRAND IS ARMORED AGAINST CORROSION









The job of armor is to protect. In the case of steel strand, the armor is the protective zinc coating that encases every wire. But some zinc coatings are better than others, and therefore cost less in the long run. A great many buyers, with an eye on the budget, have now standardized on Bethlehem strand with the bethanized zinc coating.

Bethanizing is a very successful process developed by Bethlehem—a process that bonds the zinc to the strand by an electrolytic method. The coating thus produced is so uniform and ductile that it will resist cracking or peeling under severe deformation. This is the best possible protection against moisture and other corrosive influences.

Furthermore, the bethanized coating offers another great advantage to users. It is available in three different weights—A, B, and C. Coating A is equivalent to extra-galvanized. B is twice the thickness of A. The heaviest, C, is three times the thickness of A. In price, there isn't a great deal of difference. Thus the user can select a coating that exactly meets his needs, and can, at the same time, keep his costs from going sky-high.

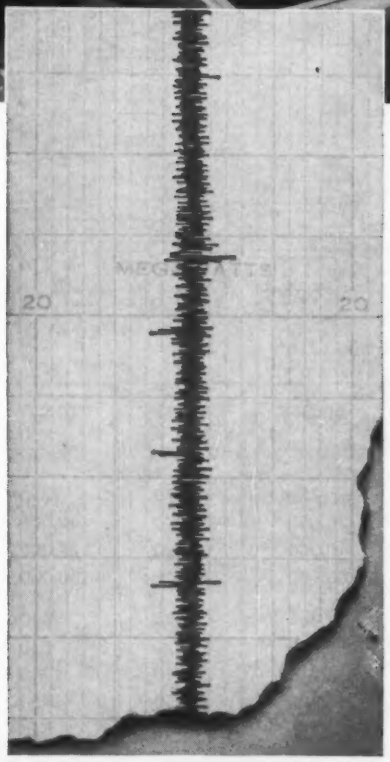
There's much more to be told about bethanized strand. Space prevents our telling it here. But if you'll call our nearest office, a Bethlehem man will be glad to give you the full story. It makes good listening.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Two men of the L&N engineering team which makes load allocation a cost-cutting science . . . shown in the Central Illinois Public Service Dispatcher's Office at Pana, Ill.



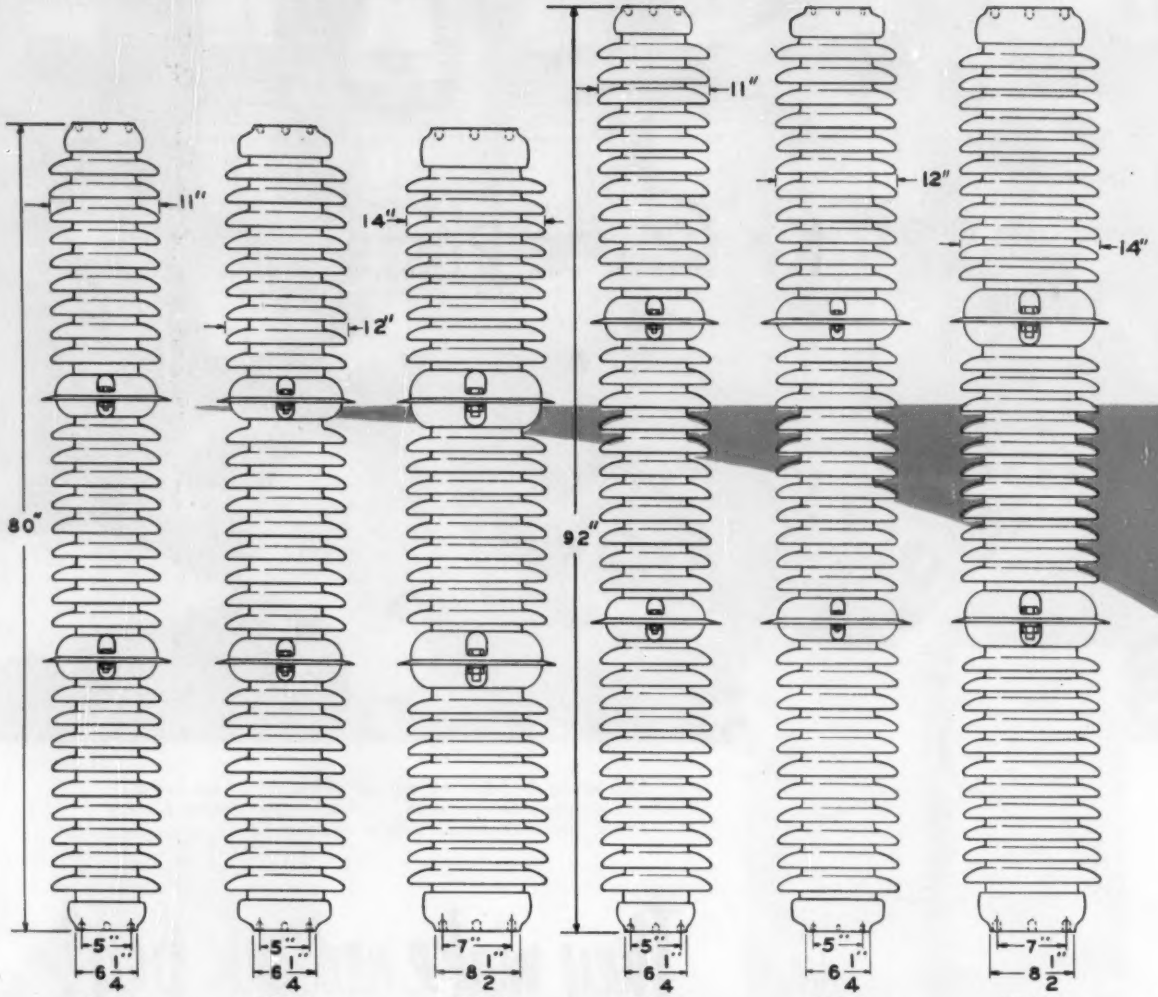
Actual size section of chart record

They make red ink pay!

To the trained operating engineer, those red curves spell fuel savings. They're charted by the ever-present Speedomax Telemeters and Recorders – integral components of the Leeds & Northrup Area Control installations across the country.

Area Control makes sense to operating men because it's the only load control with the flexibility that lets your Dispatcher allocate generation as required: either on a strictly incremental basis, or in any other manner to meet his area's regulating requirements. Then too, he can at all times schedule interchange precisely with neighboring utilities.

And, the beauty of today's Area Control is that it combines advanced, field-tested equipment (new, faster telemetering; new Area Control allocation circuits; Early-Bird type computers) with application engineering based on *hundreds* of control installations . . . in daily operation. It's the combination offered only by L&N . . . the organization that can make your operating "red ink" pay dividends.



50742 51688 51202 50637 50439 51689

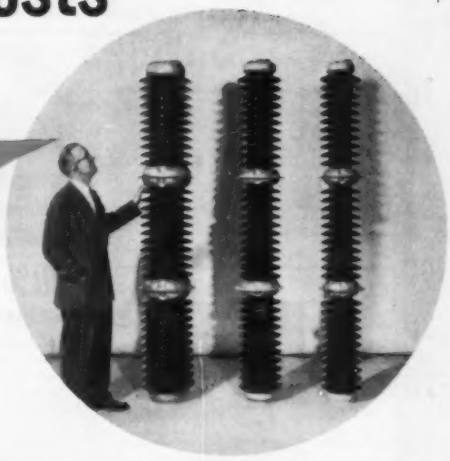
Catalog Number	50742	51688	51202	50637	50439	51689
Voltage Rating, Kv	196/230	196/230	196/230	230/287	230/287	230/287
Cantilever Strength, lbs.	910	1450	2750	750	1170	2300
Tension Strength, lbs.	20,000	25,000	40,000	20,000	25,000	40,000
Torsion Strength, inch-lbs.	40,000	90,000	120,000	40,000	90,000	120,000
Compression Strength, lbs.	60,000	75,000	100,000	60,000	75,000	100,000
60-Cycle Dry FO, Kv	575	575	575	660	660	660
60-cycle Wet FO, Kv	475	475	475	570	570	570
Impulse Flashover, Kv Pos.	1010	1010	1010	1210	1210	1210
Impulse Flashover, Kv Neg.	1240	1240	1240	1450	1450	1450
60-cycle Withstand, Kv Dry	465	465	465	545	545	545
60-cycle Withstand, Kv Wet	385	385	385	455	455	455
Impulse Withstand, Kv	900	900	900	1050	1050	1050
Test Voltage, Radio Infl.	125	125	125	146	146	146
Maximum RIV, Microvolts	500	500	500	500	500	500
Leakage Distance, in.	165	165	165	198	198	198
Dry Arcing Distance, in.	64	64	64	76	76	76
Net Weight, lbs.	310	370	580	360	430	645

ANNOUNCING

Lapp 230 Kv Station Posts

IN 3 STRENGTH RATINGS

...IN 2 BIL WITHSTAND RATINGS



To designers of stations at 230 Kv, Lapp offers its proved Station Post in two BIL series . . . 900 Kv withstand and 1050 Kv withstand . . . in standard strength, high strength, and in new extra-high strength that possess cantilever values greater than those of any switch and bus insulators ever offered before at this voltage.

EASIER, FASTER TO INSTALL Lapp high-voltage Station Posts cost less to assemble and handle than do conventional pin-cap stacks for switch and bus use. They weigh less and are composed of fewer sections. Stack for stack, a comparison with available conventional station insulators shows the Lapp Station Posts to be approximately 30% lighter in weight.

All Lapp 230 Kv Station Posts consist of three sections, each with caps cemented at the ends, and bolted together with four hex-head bolts. A total of eight bolts completes the assembly. End caps have standard bolt circles, require no sub-bases, spacers or adapters.

LAPP POSTS ARE *STIFFER* The Lapp Station Post unit is a one-piece porcelain post with caps cemented at the ends in large area, low tension compression grip . . . as compared to the nested porcelain shells and internal pin of conventional stacking units. Under cantilever load, deflection of Lapp Posts is considerably less than that of conventional pin-cap insulators; laboratory measurement shows the reduction in deflection to be approximately 50%. This increase in rigidity overcomes the serious problem of switch alignment commonly encountered by operators of 230 Kv substations.

STATION POST PERFORMANCE In addition, these insulators provide all the well-known advantages of Lapp Station Post design . . . porcelain cracking or puncture is eliminated because the hardware is on the outside . . . freedom from radio interference without need for conductive coatings . . . better service and lower maintenance cost under dirt conditions . . . greater resistance to arcover and mechanical attack.

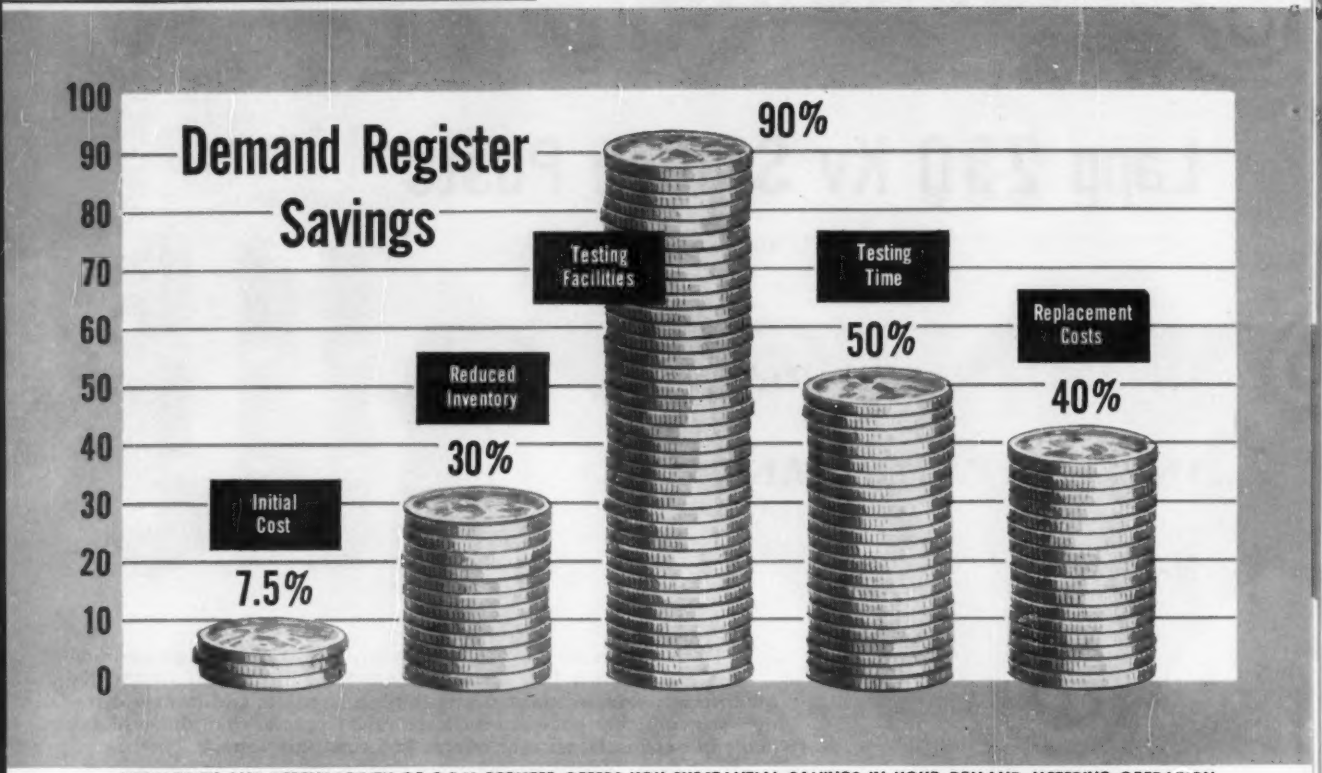
At 230 Kv too, Lapp Station Posts provide an *extra* margin of operating security, low upkeep and long life.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp

ADVERTISEMENT

DEMAND METERING



VERSATILITY AND DEPENDABILITY OF G.E.'S REGISTER OFFERS YOU SUBSTANTIAL SAVINGS IN YOUR DEMAND METERING OPERATION

Demand Registers: The Most Economical Means to Reliable Demand Metering

- Versatility of demand register offers reduced inventory costs
- On the line testing and maintenance assure lower operating costs
- Accuracy of register is unchanged during life

The many cost-saving features of General Electric's demand register offer you assurance of reduced metering costs. The flexibility of the demand register makes possible a 30% savings in reduced inventory, while the interchangeability of the register provides a 40% savings in replacement costs.

These savings plus the dependable, accurate operation of G.E.'s mechanical demand registers have led to its increasing acceptance by the utility industry. Since 1952, this acceptance has been marked by an increase of 70% annual sales of demand registers, as compared to but a 40% increase in the total demand meter market.

REGISTER FLEXIBILITY . . . The versatility of design of General Electric's demand register offers the opportunity of converting the register to different scale classes, electrical ratings, or time intervals. Standardization on one register ratio with a change in only the multiplier is but one of the many cost-saving methods which is available with only a demand register.

REDUCED INVENTORY . . . The opportunities for reduced inventory are substantial with the use of demand registers. Any stock single-phase or polyphase watthour meter can be converted to a demand meter merely by substituting a demand register. This adaptability which results in reduced inventory and operating costs is unique with demand registers.

IN SERVICE . . . A watthour meter can be readily converted to a demand meter simply by the interchanging of registers. Also, quick,

easy, accurate and low-cost field testing can be realized with demand registers. With the use of a G-E self-checking adapter, the need for elaborate testing equipment is eliminated and costly hours of labor are greatly reduced.

REDUCED TESTING . . . General Electric engineers have released test results which give assurance of increased reliability of demand registers. These tests show that the life of the register rotor has been extended up to 10 years. This fact means that the register will need testing and maintenance only during periodic meter tests.

DIRECT GEAR DRIVE . . . Not only is the register on the same testing basis as the meter but also the demand register possesses the same stability of calibration as the meter. This high accuracy remains unchanged during life, and thus assures reliable operation for years. In comparison with other types of demand metering devices, the register is relatively unaffected by such variables as friction and climate.

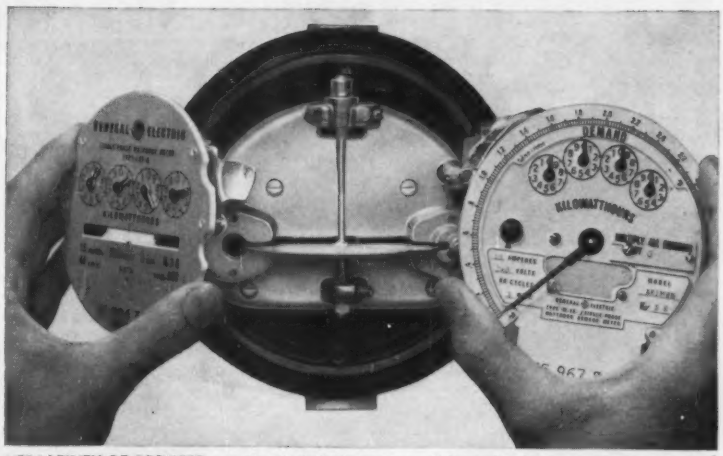
These facts offer you the greatest possible assurance that General Electric's demand registers are your most reliable means to low-cost demand metering.

MANY UTILITIES . . . Increasing numbers of utilities are taking advantage of the benefits offered by demand registers. Here are but a few: Commonwealth Edison Company, Wisconsin Electric Power Company, Kansas Power and Light Company, Duke Power Company, Pacific Gas and Electric Company, Southern California Edison Company, Public Service Company of Oklahoma, and New Orleans Public Service Inc.

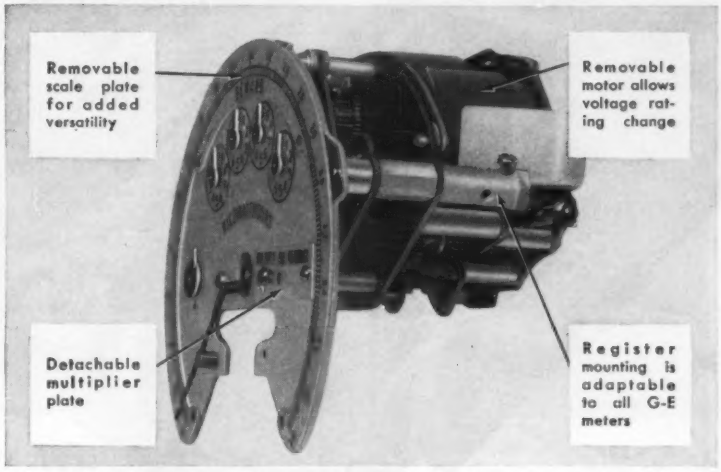
FOR MORE INFORMATION . . . If you would like more information on General Electric's mechanical demand registers, write to Section 621–13, General Electric Company, Schenectady 5, N. Y.

Progress Is Our Most Important Product

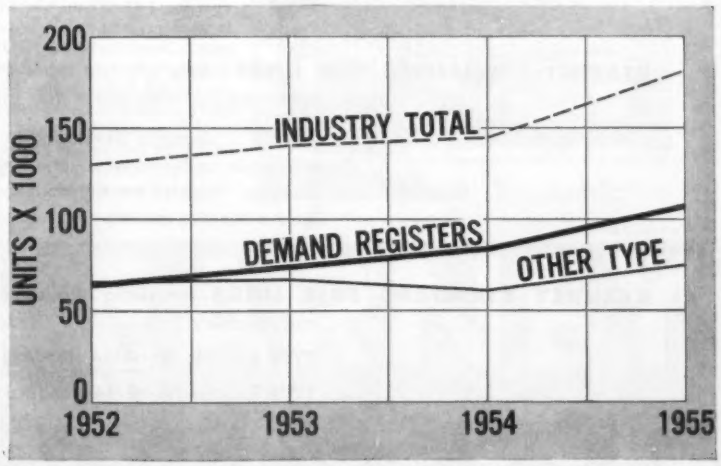
GENERAL ELECTRIC



VERSATILITY OF REGISTER provides installation on any G-E single-phase or polyphase meter.


Removable scale plate for added versatility
Removable motor allows voltage rating change
Detachable multiplier plate
Register mounting is adaptable to all G-E meters

FLEXIBILITY OF DESIGN allows change in scale classes, electrical ratings, and time intervals.



INCREASING USE of demand registers has resulted from the dependable low-cost operation.

For fewer outages... without sacrificing protection

TYPE KS... specially developed to protect and yet keep outages to a minimum on circuits subject to switching and lightning surges ... can carry overloads up to 150% indefinitely without damage to fuse link or cutout.

KEARNEY *SPECIALIZED* FUSE LINKS—here are two types of KEARNEY Specialized Fuse Links, known for accuracy and widely used throughout the industry.

TYPE X... specially developed to keep transformers in service during overloads and surges... yet always interrupting current before the damage range of the transformer is reached. Opens 230% of rated load within five minutes.

KEARNEY *STANDARD* FUSE LINKS—providing the same accuracy, precision performance and reliability.

TYPE K... the EEI-NEMA standard fast fuse link.

TYPE T... the EEI-NEMA standard slow fuse link.

you need KEARNEY

SPECIALIZED FUSE LINKS

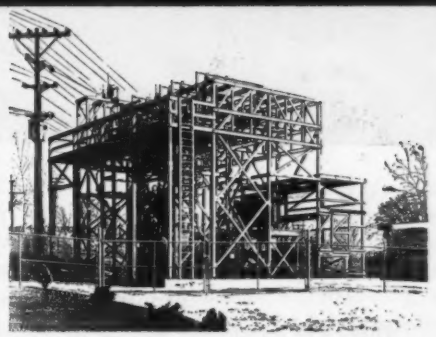
It stands to reason that average "fast" and "slow" fuse links cannot meet all the specific needs of your circuits. For safe operation with an absolute minimum of annoying outages, you need *specialized* KEARNEY fuse links. They're precision-engineered . . . with *matched* time-current characteristics . . . making possible easy and accurate coordination.

LINEMEN LIKE the time-saving, trouble-saving KEARNEY pull-tab Fuse-Pak . . . helps them select the right link quickly and accurately . . . even with gloves on. All KEARNEY Fuse-Paks are color-coded to save time and prevent mistakes.

JAMES R. KEARNEY CORPORATION
4224-42 CLAYTON AVENUE • ST. LOUIS 10, MISSOURI
Canadian Plant: GUELPH, ONTARIO

FUSE LINKS FIELD TESTED . . .

Here at KEARNEY's Substation Laboratory of 150,000 KVA Transformer Capacity—with a back up power of 445,000 KVA all equipment is tested under rigorous field conditions. KEARNEY Certified Ratings are actual, proved performance ratings . . . not just theoretical calculations. You can be sure they will do the job they are supposed to do . . . with a generous margin of safety!



JRK-311RR

for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify KEARNEY
JAMES R. KEARNEY
The Mark of Quality PRODUCTS

Transformer fabrication must be done carefully, with skill . . . to assure proper performance and to prevent damage that might later result in breakdowns.

That's why transformer fabrication requires men with ability . . . and plant capacity. Moloney has both, and for you it means transformers that are dependable . . . because they're properly designed and skillfully fabricated to provide better overall operating performance.

ME55-55

Specify Moloney . . . Get Dependability at its Best . . . All Along the Line

LIVE BETTER ELECTRICALLY

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Load Tap Changing Transformers Regulating Transformers • Step Voltage Regulators • Primary Unit Substations • Secondary Unit Substation Transformers • Network Transformers • Series Street Lighting Transformers Subway Transformers • Industrial Dry Type Transformers • Capacitors • Magnetic Components For Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

EDITORIALS

Preference Wins Again

Electric company customers are the forgotten people in the platforms of both political parties this year. The Republicans, for the first time in recent history, joined the Democrats in indorsing preference for public bodies and cooperatives in the purchase of federally produced power. This leaves the electric company customer low man on the totem pole when it comes to sharing in the federal power which his tax dollars make possible.

Republican support for the preference laws was written in this platform language:

"In marketing of Federally produced power we support preference to public bodies and cooperatives under the historic policy of Congress."

The Democrats, following precedent of previous platforms, adopted this language:

"We shall once more rigorously enforce the anti-monopoly and public body preference clauses including the Holding Company Act. We shall preserve and strengthen the public power competitive yardstick in power developments under TVA, REA, Bureau of Reclamation, Bonneville, Southeast and Southwest Power Administrations and other future projects, including atomic power plants, under a policy of the widest possible use of electric energy at the lowest possible cost."

These planks in both platforms indicate that public power and rural co-op spokesmen have been highly effective. They can now rightly claim that "preference" has bi-partisan support.

At the same time these planks show that electric company customers have had no effective representation before platform committees. Electric company organizations did not seek to be heard. Without vigorous presentations in such forums and more companies devoting themselves to educational work at the local level, little headway can be made. Certainly the recent natural resources conference at Montana State University (EW, Aug. 27, p 52) disclosed no such unanimity on "preference" as is indicated in the party platforms.

The "preference" language in both platforms must be viewed as a further setback in the fight for a non-discriminatory federal power marketing policy. It emphasizes the need for a better organized educational program by electric companies. It dramatizes the necessity for electric companies to proclaim their views openly and loudly in every available form.

Area Development: A 'Must' for Industry Progress

Today only one of every four electric utility companies (107 out of 424) is engaged in area development work. Only two in eleven have separate departments concerned with developing the company's area. These figures are based on a 1955 survey by the Area Development Committee of the Edison Electric Institute. They are not precise because every company informally promotes its area. But they are exact as to those companies with formal programs and established departments.

So important today to the economy of every part of the United States is area development that no region, city, or town can progress without it. Actually without support of such a program they will not even stand still. They will slide backwards.

And so important today is the electric utility in its area that it must be the leader of any formal area development program.

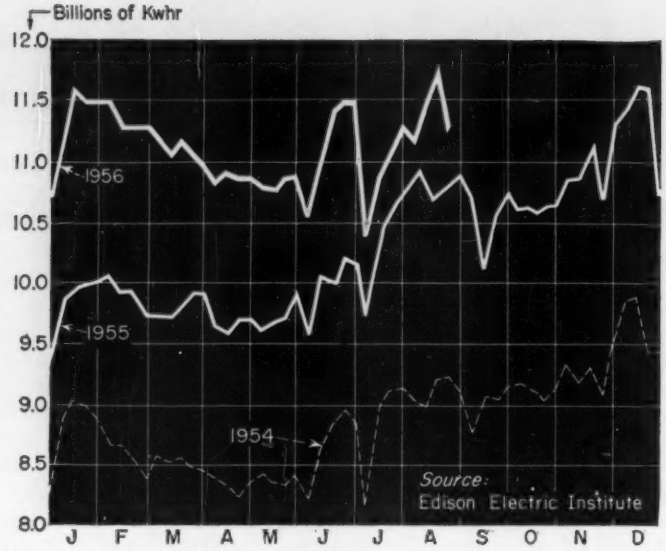
The material in this issue, prepared with the cooperation of the EEI Area Development Committee, is intended to spur nationwide participation by electric companies in the development of their service areas. Additional information may be found in past issues of Electrical World. And future issues will add to this stock of knowledge.

There is a belief that electric utilities are competing with each other in their area development programs to get industrial companies to move into their particular areas. But today's expanding economy provides plenty of room for everyone to grow. No company serves a territory which has progressed to the limit of its resources. A carefully planned development program will add much to the wealth of any area.

Area development's big job is to promote the area served by the electric utilities and continue to improve the standard of living. General business can't help but grow. New plants and facilities will be going up somewhere. Electric utilities which fail to promote that growth in their own service areas will find that they are selling themselves, their communities, and their customers short.

ELECTRICAL WEEK

LAST MINUTE



OUTPUT

Week ended Aug. 25
11,340,000,000 Kwhr
Up 4.0%

Atomic Energy Commission requirements—1,125,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 2.6%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Aug. 25	+4.0	+11.1	+3.7	+3.0	+2.0	+3.0	+2.2	+11.7	+2.8	+8.0
Aug. 18	+9.1	+11.0	+5.2	+8.8	+11.8	+6.2	+24.7	+15.3	+6.1	+5.2
Aug. 11	+7.5	+7.4	+3.3	+7.6	+12.5	+5.9	+15.1	+15.8	+6.1	+4.2

Seasonally Adjusted Index 213.5 Week Ago 222.5 Year Ago 205.7

Here are the issue's highlights . . . Tomorrow's coal prices will be shaped somewhat by the success with which Edward G. Fox deals with United Mine Workers in his new capacity as president of Bituminous Coal Operators Association. No fight imminent . . . Indiana & Michigan Electric Co to get first of two AG&E-system 450-Mw generating units . . . Dc English Channel cable may use reconduction principle . . . Niagara Mohawk to restore one-third of Schoellkopf . . . Pacific P&L studies hydro-coal combination to help relieve Northwest power shortage . . . How to apply clipping offsets to hold unguyed poles straight on hillsides . . . Experience with aerial cable . . .

Expulsion tubes shield 69-kv lines, cut lightning interruption dramatically at little cost . . . TVA reveals lower rates charged by distributors—some below 1933 level . . . Poll shows public favors partnership 3-to-1 . . . SEC proposes simpler stock ads . . . Reflectorized symbols case equipment identification.

Officials of Niagara Mohawk Power are scheduled to meet with New York Power Authority. They will reportedly discuss authority's recent application filed with FPC asking for state development of full amount of Niagara Power available to U.S. under 1950 treaty with Canada. It is believed authority officials are seeking assurance that the utility is ready to give up any and all rights it has on the river in return for a power allocation.

Consolidated Edison awards another major equipment contract for its nuclear power plant at Indian Point, N. Y. Foster Wheeler Corp receives the company's $3,250,000 order to design and build an oil-fired superheater.

Housepower sales training forums are set for Sept. 13 at Roosevelt Hotel, New York, and Sept. 19 at Palmer House, Chicago, to brief utility men who will instruct local Housepower training courses for electrical contractors.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Washington Wire . . . Northern States Power files application with FPC to acquire Interstate Power's Waconia properties. Base purchase price is set at $2,275,000. Power for Waconia area, which is encircled by service area of Northern States, is purchased at wholesale from Northern States . . . FPC okays acquisition by Washington Water Power of Light House System in Shoshone County, Idaho. The merger is of properties under FPC jurisdiction and excludes some facilities used in mining and smelting operations.

Baker County (Ore.) Grand Jury indicts Idaho Power for starting construction of Brownlee Dam at Hells Canyon without license from Oregon Hydroelectric Commission. Company's attorney immediately filed a demurrer asking dismissal of the complaint. Maximum penalty is $1,000 fine and six months jail.

If utilities act before Sept. 15, they can make some economic gains under new regulations on rapid tax depreciation. Newly issued but long delayed rules offer two choices: (1) Utilities which did not develop such depreciation can do it now by filing an amended return for 1954 and 1955; or (2) Utilities which have adopted "sum-of-years digit method" using a composite rate can recheck to see if that method conforms to regulation. If it doesn't, clear promptly with engineering section of Internal Revenue Service. If they disapprove, utilities may want to switch to "declining method."

Ohio Edison applies to Securities and Exchange Commission for an okay on its acquisition of electric plant and distribution facilities of Village of Plain City, Ohio . . . Proposed property tax on transmission lines of Iowa co-ops is protested strongly by Iowa Rural Electric Cooperative Association. The group claims it is "paying our fair share of gross revenue in taxes."

"Preference clause" is endorsed strongly by David A. Hamil, REA administrator, at Denver meeting of 80 REA field representatives from 48 states and Alaska. "As long as it is the law, it will be the policy of REA," Hamil says . . . REA gives final approval to long-sought $10.5-million loan to four co-ops banded together as Colorado Ute Electrical Association. They will build a 25,000-kw steam plant and a 168-mi, 115-kv transmission line.

ABOUT PEOPLE IN THE INDUSTRY

Atomic Energy Commission's Chairman Lewis L. Strauss announces approval of contract negotiations for proposed 10,000-kw nuclear power plant at Anchorage, Alaska. Chugach Electric Association and Nuclear Development Corp made joint plant proposal. It would use heavy water as moderator and liquid sodium as coolant—a combination reportedly never used before. Power cost would be about 22 mills per kwhr.

Named to represent the U.S. at World Bank Conference on Atomic Energy are **AEC Chairman Strauss and W. Kenneth Davis (right),** director of AEC's Reactor Division. They will meet Sept. 27 in Washington to discuss "Atomic Energy and Economic Development." Other participants include: Edwin Plowdon, chairman, British Atomic Energy Authority; and Sir John Cockroft, head of England's Harwell Establishment.

More News About People page 166

Representing mine owners, Fox must deal with Lewis and Tom Kennedy in . . .

Shaping Tomorrow's Coal Prices

The mantle of the late Harry M. Moses, who for years led the soft coal industry's negotiators in talking contract with John L. Lewis and United Mine Workers Vice Pres Tom Kennedy, fell this month on the broad and experienced shoulders of a 55-year-old Pennsylvanian—Edward G. Fox.

His appointment as president of the Bituminous Coal Operators Association, to close observers of the industry, was taken as an augury of the mine operators' firm desire to perpetuate the new harmony that had developed in labor-management relations during the Moses regime.

That same desire is expected to guide his opposite number. Few anticipate any early move by Lewis for new wage or other major contract demands, despite the recent generous settlement in the steel industry and soft-coal's own substantial economic recovery.

The mine workers, it is noted, are not lacking for recent contract gains themselves. Lewis, in his last negotiations with Moses, won a $2-a-day wage hike for his soft coal miners. The last 80¢ of that package went into effect only this April.

No Imminent Battle Looms

There is also the reported disposition of the aging mine worker chief to give Fox a chance to get the feel of his new job. This Fox has already set about to do with the energy that brought him out of the pits—where he mined coal as a teen-ager—to the presidency of the Reading Anthracite Co, and the chairmanship of the Anthracite operators' wage committee.

In the latter capacity he dickered with Lewis on behalf of the industry's hard coal producers, earned the latter's respect as a tough, fair-minded and knowledgeable negotiator. In the month between his appointment and occupancy of his new post, Fox toured the major soft coal fields to meet and get a first-hand picture of the problems of his new constituents. Both the bituminous operators and the union expect that with the transition complete, Fox will more than adequately fit Moses' shoes.

Meanwhile a review of the immediate past shows that coal is continuing to gain as the principal energy source in the production of electric power. A study released by the National Coal Association announced that consumption of coal in production of electricity increased 20% in

1955. At the same time, the cost dropped almost 4%.

"The present trend in utility fuel consumption demonstrates the dependability of coal as a fuel, and the recognition that coal reserves in the U. S. are more than adequate to meet all present and future demands," said Tom Pickett, executive vice president of NCA, in releasing the study.

Coal Outlook Remains Bright

Reserves of bituminous coal in the U. S. presently are estimated at 1,900 billion tons, enough to meet demands for many years.

Last year, electric power production utilized 136.6 million tons of coal compared with 113.9 million tons in 1954. The figures are based on coal-fired plants accounting for 95% of total steam electric power generated.

The NCA study points out that coal price in 1955 dropped 3.8% on an "as consumed" basis, while fuel oil price rose 1.2% and natural gas 4%.

In the case of the "coal-competitive" areas, such as New England, the North Central states and Middle Atlantic region, the study said, coal in 1955 held 85% of the total steam-electric utility fuel market, a rise of almost 5% from 1954. Since 1950 the net gain in coal's share of this rapidly expanding market was more than 6%.

Coal-fired electric utility plants in the east North Central states showed a 1955 gain of 20.5% in coal consumption, to 56.5 million tons from 46.9 million tons in 1954. The biggest percentage gain was scored in the east South Central states, 44.2% to 16.2 million tons from 11.3 million tons in 1954.

New England coal-fired electric utility plants expanded their coal consumption in 1955 by 33.8% to 4.8 million tons from 3.6 million tons; South Atlantic states' plants raised consumption 13.1%, and Middle Atlantic states increased 13.7%.

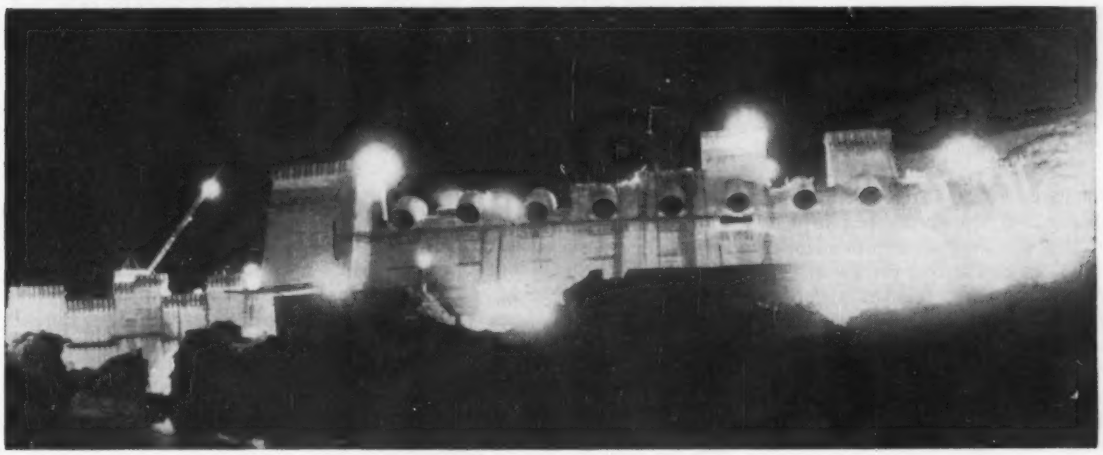
TVA's Coal Consumption Leaps

In the last five years, coal consumption of the Tennesee Valley Authority has risen from one million tons to 18 million. In an effort to clarify the picture regarding charges that TVA has been forcing mines to sell coal at below cost, the Authority recently issued a 16-page report on its coal-buying program.

The report points out that TVA buys coal after receiving competitive bids, as required by the TVA Act, and that "by far the greatest share of the coal is bought under term contracts—usually of one to three years' duration—which are awarded after advertising and after sealed bids are opened in public." TVA also advertises for "spot" coal needed (smaller quantities), but this amounts to less than one-fourth of the planned coal receipts for a year.

"Firms which have been furnishing coal continue to bid for new contracts," the report continues. "Coal mine closures . . . have been few among those producing coal for TVA. Many operators are taking advantage of the new TVA market to develop new mines and expand the output of existing mines." The report also states that "all TVA invitations for term coal bids suggest escalation provisions" to compensate for wage increases.

The "new TVA market" refers in part to the vast amounts of power now taken by Atomic Energy Commission, and to new TVA steam plants which can burn low-grade coal that formerly would have been sold as a mine by-product.



Brazilian Project Begins Generator Installation

Installation of two of ten 40,000-kw generators has begun at Brazil's Peixoto hydro-electric station, reportedly one of the largest devolepments of its kind in Latin America. Two turbines have already been concreted in.

Penstocks can be seen in this panoramic night view of the 440,000-kw dam, which is located in the state of Minas Gerais, near the border of the rapidly growing state of Sao Paulo. Initial cost of the project is estimated at $42 million, with ultimate costs set at about $98 million.

The plant is being constructed by Compania Paulista de Forca e Lux, an affiliate of American & Foreign Power Co, Inc, and was designed by Ebasco Services, Inc, working with Ebasco International Corp.

Peixoto plant has 88-billion cu ft of usable storage and is the upstream storage project for a series of four or more power projects along 150 mi of the Rio Grande in Brazil.

I&M Plans Giant Unit for New Plant

Called the "world's largest," the 450-Mw unit is slated for Indiana & Michigan Electric Co's Wabash River plant near Terre Haute, Ind. First of two for AG&E system

A new $58-million plant to house a 450,000-kw generating unit, reportedly the world's largest, will be constructed by Indiana & Michigan Electric Co on the Wabash River 20 miles south of Terre Haute, Ind.

The unit, which will be 73% larger than any now in operation, is the first of two planned for the seven-state American Gas & Electric Co system. It is expected to be the most efficient power producer in the world.

The power plant will be served by a coal mine to be developed nearby by Ayrshire Collieries Corp. The mine and power station will be connected by a private six-mile railroad to be built, owned, and operated by Ayrshire. Cost of the mine and railroad is estimated at over $4 million.

A 330,000-v transmission line will tie the plant to the I&M system, which is interconnected and integrated with the rest of the AGE system.

Construction Starts Soon

Construction is expected to start in the near future, with completion slated for late 1958. Provision has been made in the plant's design for eventual expansion to 900,000 kw.

The plant is expected to show an improvement of 5% in thermal efficiency over the world's best to date. It also will show an improvement of 7½% in capital cost per kw of generating capacity, brought about by economies due to larger size of unit, higher speed of the turbine, space reduction, elimination of boiler house, and other factors. It will occupy a cubic space only about one-third larger than 225,000 kw.

Site of the new plant, a tract of about 875 acres with a river frontage of about 1½ miles, was chosen for two reasons: the need for greater generating capacity in the growing Indiana-Michigan area, and the plant's proximity to an abundant reserve of low-cost coal and an abundant water supply.

The 450,000-kw unit, said Philip Sporn, president of AGE and I&M, "is the result of design and construction experience obtained from the world's first super-critical pressure unit . . . at Ohio Power Co's Philo plant. The developmental Philo unit will operate at the extreme end of the possible combination of steam pressures and temperatures, at 4,500 psi and at a temperature of 1,100F.

To Be Commercially Better

"These extremes in pressure and temperature have been carried out successfully in the design of the Philo unit, but they have been reduced to a more commercially acceptable basis on the new unit. Because of the difficulties in obtaining economically the necessary alloys for extremely high temperatures, the temperature for the new unit has been reduced to 1,050 F. And, since pressure and temperature go hand-in-hand for maximum economy in power generation, the pressure of the new unit has been established at 3,500 psi . . ."

The new boiler, of outdoor design, will be built by Babcock & Wilcox Co. It will exhaust to a stack about 500 feet above ground level.

General Electric Co will build the turbine-generator. Turbine will be cross-compound in design, with both the high and low-pressure elements operating at 3,600 rpm, with the load being equally divided between the two generators.

Large-Scale Expansion Slated by Three Utilities

Plans for construction of large generating units have been announced by the following utilities:

- Houston Lighting & Power Co has ordered the third unit, a conductor-cooled type, for its Sam Bertron station. First of its kind and system's largest, it will have maximum capability of 240,000 kw.
- Otter Tail Power Co will build a 50,000-kw, $10-million unit, largest in its 3-state area, to operate on North Dakota lignite coal. The addition, to be installed at Hoot Lake plant, Fergus Falls, Minn., will boost plant capacity by six times.
- Florida Power & Light Co will increase system capacity by 64% with addition of four 160,000 kw units between now and 1960. Two are now under construction at Fort Lauderdale plant, for 1957 and 1958 completion.

NEWS IN BRIEF

ATOMIC

Wheels have begun to turn in the machinery of producing **Florida Nuclear Power Group's** first atomic power plant (possible 200 Mw capacity) to be built somewhere within suitable transmission distance of Miami, St. Petersburg, and Tampa. Member utilities are Florida Power Corp, Florida P&L, and Tampa Electric Co.

Under a recent agreement, **England** will make available to **West Germany** research reactors; fuel elements; unclassified information on certain topics concerning design, construction and operation of these reactors; and training programs that may be mutually beneficial. Agreement terms remain to be defined, but premise is that materials and information are to be used for peaceful purposes only.

Koppers Co and Kennecott Copper Corp have announced a joint proposal to be considered by Atomic Energy Commission Oct. 1 in which they would construct a feed materials plant to produce 5,000 tons a year of uranium salts. Government plants are now turning out the salts.

TRANSMISSION

McNary-Ross $14-million, 345-kv transmission line is to be energized on a test basis soon. It has been operating at 230 kv since October, 1955, pending installation of two giant autotransformer banks at McNary and

(*Continued on page* 169)

Because of Fallen Wires . . .

As a result of the death of a 15-year-old girl killed last year by a live wire that fell on a road near her Greenwich home, the Connecticut Public Utilities Commission has ordered Connecticut L&P to adopt a six-point power line safety program.

CL&P must (1) File an outline of its tree-trimming program in Greenwich, (2) Finish a complete cooperative plan for tree trimming by the end of 1956, (3) Install more sections of a new type of aerial cable (three wires held apart by triangular plastic spacers) as soon as possible, (4) Work out a mutual-aid agreement with N. Y. Telephone Co for patrolling lines and providing linemen to stand by "hot" wires felled by storms, (5) Arrange with city and state authorities for police and fire department help in guarding fallen wires, and (6) Continue a company program aimed at informing citizens of the hazards of fallen wires.

One Cable Across Channel

From Sweden comes speculation that the proposed high-tension dc transmission project that will enable surplus power to be shuttled between England and France will be executed with help of a Swedish firm, and that it will be patterned after the 100-kv dc cable linking Sweden with Gotland Island in the Baltic. Installed a few years ago, the Gotland cable attracted wide attention by using water instead of wire as the return circuit.

Use of the re-conduction principle on the English Channel project would simplify the cable arrangements and would cut disturbance or interruption risks substantially, the Swedes observe.

GE to Build in TVA Area

General Electric announces that Murfreesboro, Tenn., has been selected as a site for its new appliance motor plant. The town (pop. 13,052) is served by the Murfreesboro Electric Department. The plant will manufacture small motors for appliance manufacturers and is expected to employ about 300 persons by 1958.

GE has a lamp division plant in Memphis. During the war it operated a temporary plant at Bowling Green, Ky., a company spokesman said.

When decentralization of the company got under way in 1952, several sites in the Tennessee Valley were considered, but were ruled out "by a hair's breadth" for reasons that had nothing to do with the availability or cost of power. "Power is but a small cost in manufacturing," the spokesman pointed out. "Other factors—such as production costs and shipping expenses —play far more important roles in the selection of a plant site."

The company said economic studies again were used to determine the site of its new motor plant. This time the cards fell in favor of Murfreesboro, midway between the plant's source of steel in Alabama and its principal customers in Tennessee and Kentucky. Power costs were a minor factor. GE reasserted that it was not establishing a new company policy or breaking an old one by locating in the TVA area.

Niagara Starts Restoration

Niagara Mohawk Power Corp. has announced that it will restore about one-third of the Schoellkopf power plant damaged by a Niagara Falls rock slide June 7. Pres Earle J. Machold said work will begin immediately to get four of Section 3-A's 13 generators back in service by December of this year, and the remainder by the fall of 1957. When this is done, the company then will study the wiped-out Sections B and C to assess possibilities of their rehabilitation.

Restoration of Section 3-A will cost $4 million, and will yield 104 Mw of 60-cycle power. Generators and turbines in that section were damaged principally by electrical disturbances and fire. Restoration will involve rewinding coils and replacement of various turbine, generator, and equipment parts.

Fast Atomic Reaction

Georgia's Gov Marvin Griffin has reacted fast to recommendations of the Southern Regional Education Board which recently held a three-day work conference on nuclear energy (EW, Aug 20, p 100) in St. Petersburg, Fla. Gov Griffin has created a 30-member State Nuclear Energy Advisory Commission which is to be charged with "training Georgia's young people to take their place in the coming atomic age."

This will be implemented by coordinated atomic science programs at the University of Georgia, where an $8.8-million Science Center is to be built, and Georgia Tech, where a reactor is to be built. Commission members will serve without pay.

Two Convention Sidelights

Following the Democrat convention, Virginia Electric & Power said that during the hot week beginning Aug. 12 the company set new output and peak records. Air conditioning and television loads boosted the week's production to a new high of 139.2 million kwhr, and set a new peak of 1.16 million kw between 2 and 3 pm Aug. 13.

Westinghouse reported that its sponsorship of radio and TV coverage of the convention jumped major appliance sales to dealers by 50% over the same period in 1955. Retailers apparently did a bigger volume than expected, the company observed.

Scale model of unusual project investigation, predicted to bring 67,500 kw of hydro and 100,000 kw of steam to southwestern Oregon coast, is examined by PP&L President Paul B. McKee and Tallent Greenough, Coquille city attorney, as . . .

Combination Hydro-Steam Power Plant

Pacific Power & Light Co has revealed it is ready to start investigations which could result in simultaneous development of electric power from coal and hydroelectric resources in Coos County, Ore.

The announcement, made by Pres Paul B. McKee before a meeting of county civic and industrial leaders in Coquille, follows within six months PP&L's revelation of a $250,000 research project to discover industrial water in the sand dunes across the bay from Empire. This latter project, according to McKee, is just about wrapped up.

Active Probe Planned

The utility now plans to start active investigation of a site on the Coquille River which may be suitable for a hydro development estimated at 67,500 kw.

At the same time, it will explore the possibility of using coal from a nearby field for a 100,000-kw modern steam-electric generating plant as a companion development.

PP&L has filed applications with the Oregon hydroelectric commission and the Federal Power Commission for preliminary permits to investigate the proposed site at Eden Ridge on the South fork of the Coquille. The company also holds prospecting rights for investigation of coal beds which lie on Eden Ridge. Preliminary exploration indicates the coal fields may hold a reserve of approximately 50 million tons.

McKee Cites Project Cost

Cost of the exploration of the two potential developments is expected to run between $300,000 and $400,000, and total cost could amount to between $30-$50 million, said McKee.

It might be possible under favorable circumstances to develop as much as 300,000 kw from the two projects, he added.

McKee told the group that the combination of a possible hydroelectric site beside coal deposits is a rare one, especially in the fuel-short Pacific Northwest.

"If we are able to work out a feasible development of these two resources, it could mean both fuel and an industrial raw material as well as a new source of power for the region," McKee stated.

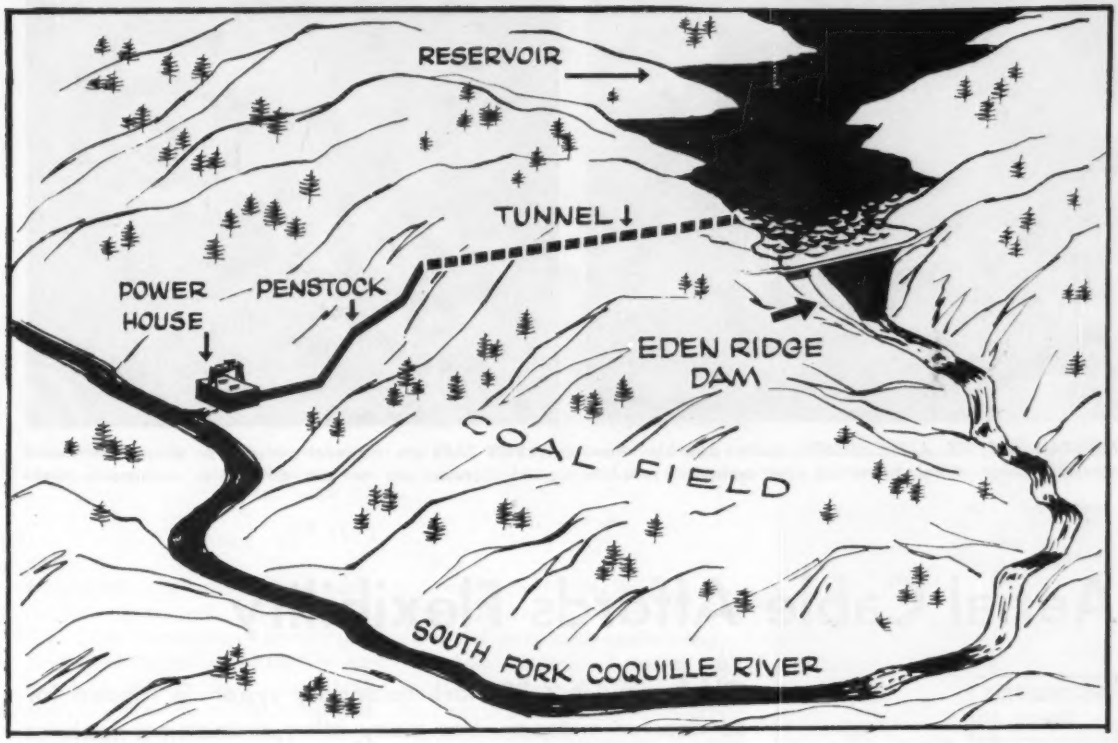
Development of a large power source in this section of southwestern Oregon would be especially valuable as a stabilizing force for the northwest power pool as well as a strong reinforcement for the transmission lines and the local power plants which serve the area.

The coal-hydro combination at Eden Ridge, McKee pointed out, presents an unusual opportunity to utilize the hydro power of a highly seasonal river by combining it with steam-generated electricity.

PP&L also believes that the Eden Ridge hydro development could be made to improve fishing conditions in the area.

Fish Study Undertaken

McKee said the company's own fish biologist is studying the project and declared that the company will work closely with the state departments of fish and game in its study, as well as with federal agencies concerned. The project area lies within the Siskiyou national forest.



Is Planned by Pacific Power & Light

The proposed hydro plant would make use of a 12-mi loop on the south fork of the river about 11 miles south of Powers, in which the river drops 1,650 ft in its swing around the ridge. Distance across the neck of the loop is just over two miles. Diagram shows how company would build a 2-mi tunnel through Eden Ridge in order to carry water from the reservoir to the power plant.

170-ft High Dam Proposed

Preliminary studies suggest a dam 170 ft high at a point behind the ridge and about 23 mi upstream from Powers.

This is well above the highest point in the stream reached by migratory fish, because of natural obstacles presented by more than 1,000 ft of fall concentrated in only 1½ mi of the river.

From this reservoir a tunnel 11,000 ft long would be drilled through the ridge to drop the water through penstock pipes to a power house near Delta Creek, approximately 11 mi from Powers.

McKee said that studies of the project may show a dam as high as 250 ft and a generating plant possibly as large as 100,000 kw will be feasible.

The company will look into the flood control effect a higher dam and large reservoir might have on the Coquille River.

Drill rigs to carry out an intensive exploration of the Eden Ridge coal fields are expected to move into the area soon. The deposits lie in several beds, one above the other, and cover a territory estimated at over 5,000 acres.

McKee indicated that the cost of mining the coal will be one of the important studies, and expressed the hope that the deposits are in horizontal beds which may allow low-cost mining.

Editorial Praises Utility

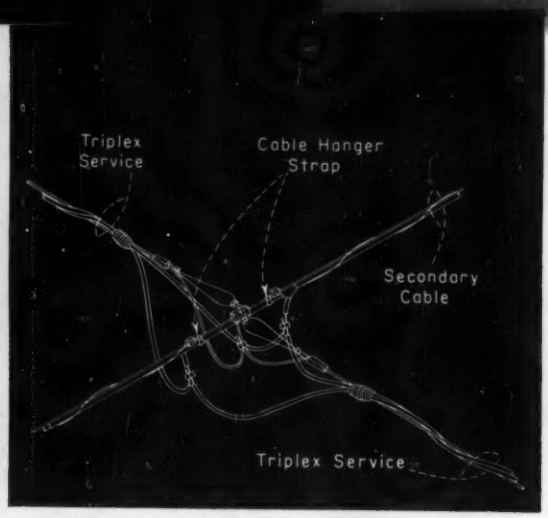
Praising PP&L's energies and leadership in undertaking the project, Oregon's "Coos Bay Times" recently said the utility's revelation "demonstrated beyond any doubt that the company's entry into this area was one of the most fortunate things that ever happened to southwestern Oregon."

Referring to the dune-water project, the long editorial continued, "Industrial water, the panacea everyone has sought for years, could bring at least pulp mills and possibly a paper mill. . . . Aside from this increased capitalization and employment in itself, the whole local logging and lumber industry would reap benefits. Here would be a local market for forest waste that would stabilize local timber and lumber economy as never before. It is pointless to go all the way back on the scale because it is obvious what all this would mean to the tax structure, to schools, to employment, and so on.

Projects Advantages Described

"The same applies to the proposed dam and coal mine at Eden Ridge. That combination project would employ between 1500 and 1800 men during the two years of dam construction and about 100 men on the final, operating schedule. The tax benefits to the county, the huge payroll poured into the area, and the addition to the peak power needs of the Northwest stagger the imagination."

MIDSPAN SERVICE ATTACHMENTS make possible direct service to house without traversing other customer's property



SERVICE TAPS are made at midspan or at any convenient point. Service can be run directly to customer's house

Aerial Cable Affords Flexibility

DISTRIBUTION Design

Oklahoma City's 29-block secondary system is tapped for services at midspan, has many other economical features

CHARLES H. WYATT, Distribution Engineer, Oklahoma Gas & Electric Co, Oklahoma City, Okla.

Aluminum aerial secondary cable has been installed by Oklahoma Gas & Electric Co in 29 city blocks of northwestern Oklahoma City. This 22,191-ft installation, now serving 500 residential customers, ultimately will serve 685. It cost $923 per 1,000 ft including poles but without transformers and appurtenances. Conventional construction would have cost $937 per 1,000 ft.

Design Spans Are 300 Ft

The design span is 300 ft. Services are taken off at midspan or wherever required. This cable system involves fewer poles, and the few used are free of services, consequently safer to climb. It has neater appearance, and each customer is served across his own property. The secondary cable's inductance is lower than that of conventional construction. Tangent pole and transformer replacements are easier and safer, and the effect of tree conditions is minimized.

Secondary cable is supported by a separate 10M messenger. Although ACSR was considered for the neutral, it is not a regular stock item; and its use would have required special hangers and lashing and span clamps. OG&E buys 1/0 bare aluminum and 10M strand in large quantities.

Neutral Bare Aluminum

The cable used is a 1/0 bare aluminum neutral and two 1/0 all-aluminum conductors with 5/64-in. Neoprene covering. Conductors were lashed to the messenger in the field.

Prestressed for one hour to 50% of ultimate strength, the messenger was installed in accordance with final sag curves. All three conductors were lashed to the messenger by 0.091-in. galvanized lashing wire on a 13-in. lay.

Extension Ladder in Use

The 40-ft Class 5 poles supporting the secondary cable and the primary were stressed to 40% of ultimate transverse loading. The cable is attached 8 ft from the tops. Joint construction allows the company 9 ft on a tangent 40-ft pole. Sag is 51 in. for a 300-ft span.

Service taps were made so that attachments may be cut and reconnected in event of trouble. Compression-type connectors facilitated tapping, and drip loops are large at service connections. The first installation took three to four times as long to make as a conventional pole service, and a tension-slack puller was used to make the tap. Now taps are made with a light extension ladder equipped with opposite hooks for safety and economy. The tension puller is no longer needed.

Poles Free of Services

Experience with the installation points up these findings:

1. The cost of four test installations of aerial secondary cable was 1.49% below that of the conventional type.

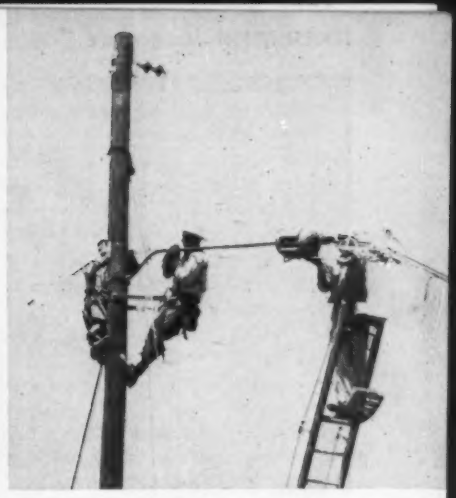
2. Poles, being free of services, are safer to climb. As most new lines are 12.5 kv, such safety facilitates necessary hot-stick work and reduces time for maintenance. Aerial cable secondary is easily covered with rubber hose and blankets.

3. The cable secondary system appears to be more resistant to wind and ice storms than open-wire construction.

Maintenance Less

4. As cable secondary design requires fewer poles, maintenance cost per kva of customers served is reduced and along with it the occasions

SECONDARIES are spun to messenger in the field. Three reels are mounted on truck, and spinner applies lashing wire as moving truck pays off the conductor



ROUNDING poles with spinner is problem in installing aerial secondaries

for disturbing a customer's premises for pole replacement.

5. Other companies report that physical characteristics of the line are improved, those in the hurricane area reporting that the cable withstands more wind than open wire and even when it comes down sometimes maintains service.

6. It has better electrical characteristics than open-wire construction, steady voltage drop being reduced to 82.3% and flicker voltage drop to 53.3%. Such improvements afford higher quality service and permit use of large transformers.

Faults Are Fewer

7. More clearance for services is available as a service can be attached at any point. Service poles for clearing buildings or other obstructions are no longer necessary.

8. Neoprene-covered secondary cable is less subject to faults caused by tree conditions which themselves are less obstructive because of the greater flexibility in locating services.

Has Extra Clearance

9. Replacing a tangent pole costs considerably less. It does not involve work on the services. When secondaries are open wire, some services must be rearranged during transfer to a new pole. Moreover, the pole for cabled secondaries is clear for hot-stick work in transferring primaries.

10. Extra clearance for transformer replacements is available because service connections can be kept away from the pole.

Compared with open-wire construction, there are these disadvantages in the use of aerial cable secondaries:

1. Although fewer, faults are more difficult to locate and the companies have yet to acquire "trouble-shooting" experience with this relatively new construction.

2. Aerial cable installation requires a special spinning tool for lashing in the field.

3. Operation of the spinner requires special training of personnel.

4. As aerial cable is 20 to 25 ft above ground, making service connections in any sort of wind necessarily involves use of a long extension ladder with hooks at the upper end.

Other Disadvantages

5. The present method of installing services costs a little more.

6. Adding a fourth wire for 3-phase service or as a street-light conductor is more difficult.

7. Additional anchoring and keeping the same pole location make replacement of deadend poles more expensive.

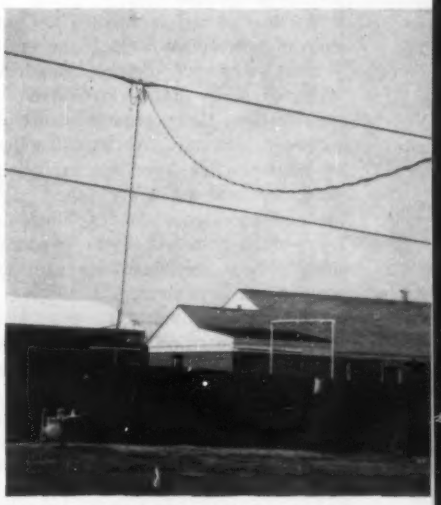
More Training Needed

8. Two or more men are needed to locate and repair secondary faults.

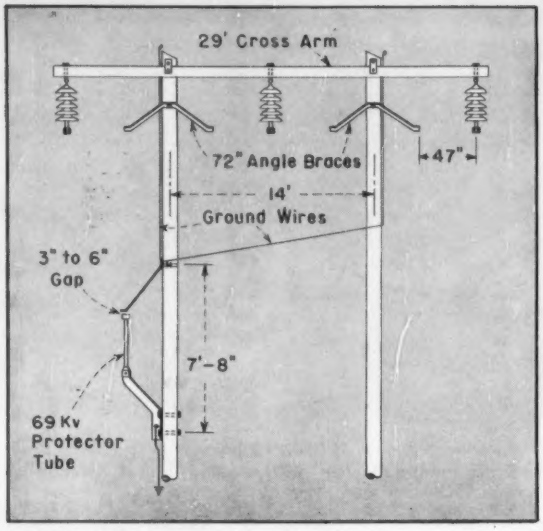
9. As services are connected to the line, there is less service clearance from the ground. Service clearances still exceed the minimum code requirements, and the services themselves are usually shorter.

10. Secondary cable system installation and maintenance call for new training of service crews.

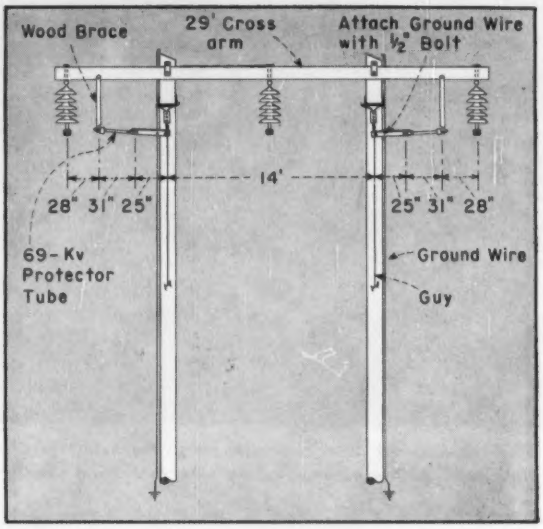
SERVICES can be attached to messenger anywhere; so poles aren't cluttered



UNCLUTTERED APPEARANCE in residential areas pleases a utility's customers



PROTECTOR TUBE on each unguyed structure of 69-kv line protects both outside conductors from lightning strikes



TWO PROTECTOR TUBES were installed on all storm guy structures of two 69-kv, H-frame transmission lines

Expulsion Tubes Shield 69-Kv Lines

Cut interruptions from lightning 90.6 and 84.2% on two H-frame lines at a third of cost for two shield wires

J. F. LONGLEY, Vice President, Superintendent of Engineering, West Texas Utilities Co, Abilene, Texas

Protector tubes greatly reduced interruptions on two 69-kv transmission lines (109.8 miles) of West Texas Utility Co. The company has about 2,350 miles of lines above 22 kv, about 2,100 miles at 69 kv. Peak load in 1955 was 186,200 kw.

As load density is only 80 kw per mile of line, construction is the most economical type. Several hundred miles of 69-kv lines have ridge-pin construction; gaps prevent puncture of ridge-pin insulators. About 480 miles of ridge-pin line have one explusion protector tube on every other pole and, in some few instances, tubes on every third pole. All 69-kv H-frame lines without shielding have gaps to prevent crossarm shattering.

The company about three years ago considered installing tubes on one or more H-frame lines, one tube on each structure because:

1. Experience indicated that most lightning strokes caused phase-to-ground faults on single-pole lines with tubes.

2. Experience indicated that lightning always hit an outside conductor.

3. Relay indications showed that a high percentage of outages on H-frame circuits was caused by phase-to-ground faults, even though ground resistances were high.

A trial installation was made with one protector tube on each unguyed structure on the 69-kv H-frame line from Childress to Shamrock, Texas. Guyed structures were not protected. Although, there was some reduction in outages, improvement was not great. Tube operations indicated that many strokes traveled to guyed structures, going to ground there and causing circuit outage. Field checks failed to find phase-to-phase faults or power arc burns on structures where tubes had operated. Ground resistances were relatively high.

On the basis of this experience, the company installed two tubes on all storm guy structures, the few other guyed structures being protected by one, two, or three tubes according to the construction. Single-pole sections got one tube on every pole. The installations were completed late in 1954. Protector tubes were placed also on the 69-kv H-frame line from Abilene to Ballinger, Texas.

Based on its 17 months' experience with 109.8 miles of 69-kv H-frame line, with one protector tube per structure, the company concluded:

1. The scheme gives reasonably satisfactory lightning protection at about a third of the cost of two shield wires, or three protector tubes per structure.

2. Assuming that a third of the strokes to the lines brought no outages, tubes on the Abilene-Ballinger line prevented 90.6% of lightning outages. The Childress-Shamrock line installation prevented 84.2%.

3. The scheme seems applicable to single-pole lines with flat configuration of conductors but would give less attractive performance at a lower insulation level.

Additional practical data on the behavior of lightning strokes to a transmission line were obtained including:

1. Lightning usually strikes only one of two or more conductors in a horizontal plane. When more than two conductors are in the horizontal plane, the outer ones afford reasonable shielding for the others.

2. Lightning strokes to a conductor seem to travel rather freely to adjacent structures without causing a phase-to-phase fault.

3. Low tower-footing resistance may be less important than is generally thought.

The Childress-Shamrock lines is

56.3 miles long, about six miles being single-pole construction. H-frame sections have 600-ft spans, 50-ft poles, and 29-ft crossarms. The conductor is 2/0 ACSR. The 53.5-mile-long Abilene-Ballinger line is practically all H-frame construction. There are about three miles of single overhead shield wire out of Abilene station. Near Abilene is a tap line some two miles long. The tap is of ridge-pin construction, having one tube on every other pole. Intermediate poles are without tube, gap, or ground wire. The main line conductor is 4/0 ACSR. The cost of tube installation averaged about $500 per mile.

Tube operations, tripouts, and "apparent" strokes on the lines are given in accompanying tables, along with outage records for 1949 through 1954. It is assumed that any number of consecutive tubes that have operated had their cause of operation in a single stroke, called an "apparent" stroke.

Average number of outages from lightning on the Abilene-Ballinger lines from 1949 through 1954 was 16.3; that on the Childress-Shamrock line, 33.3. These averages compare with an annual rate of 34 and 60.6 apparent strokes, respectively, between January 1, 1955 and June 1, 1956. It's the author's opinion that the severity of lightning then was comparable to the worst 1949-1954 years. Thus it appears that about a third of the strokes would have caused no outage had the lines been unprotected.

Tube failures on the Childress-Shamrock line are significant, reflecting the degree of protection for the circuit. At least four of the nine outages were permitted through tube failures. Without the failures, there probably would have been only five.

About half of the tubes on the Childress-Shamrock line are rated 400 to 1,500 amp, most of the others being 200 to 600 amp. Some are rated 200 to 2,000 amp. All tube failures resulted from high-impulse discharge currents. The 200-to-600-amp tubes seemed to fail at a lower impulse current than the others, a surge current of 50,000 to 75,000 amp being sufficient. Larger tubes would have a lower failure rate.

The incidence of two or more consecutive tubes operated suggests that lightning strokes travel two or more 600-ft spans without causing a phase-to-phase fault as frequently as has been previously thought. Grounds on the Abilene-Ballinger line have been checked, but not improved. Average resistance of 406 grounds is 40.7 ohms. Average resistance on structures where tubes have operated is 42.5 ohms. Those on the Childress-Shamrock line are comparable.

Table I—Tube Operations on Childress-Shamrock Line

Date of Patrol	No. of Apparent Strokes	No. of Tubes Operated	Trip-Outs
2/21/55	1	1	0
3/22/55	1	1	0
5/11/55	8	17	1*
5/23/55	12	16	1*
6/ 7/55	12	24	3**
7/ 6/55	15	32	1*
10/ 6 & 10/10/55	16	24	0
2/15/56	2	2	0
3/27/56	3	3	0
6/ 1/56	16	22	3
Total	86	142	9

*Tube failure.
**Tubes on two adjacent structures failed.

Table II—Tube Operations on Abilene—Ballinger Line

Date of Patrol	No. of Apparent Strokes	No. of Tubes Operated	Trip-Outs
3/22/55	3	3	0
4/20/55	5	7	0
5/ 9/55	1	1	0
5/24/55	11	23	1
6/18/55	0	0	0
6/23/55	2	3	0
8/ 1/55	1	1	0
8/26/55	6	8	1*
10/ 6/55	4	4	0
3/20/56	0	0	0
5/ 4/56	12	20	1**
6/ 7/56	3	4	0
Total	48	74	3

*On 8/4/55 OCB at Abilene showed a three phase fault.
**Line tripped at only one end.

Table III—Number of Cases of Consecutive Tubes Operated

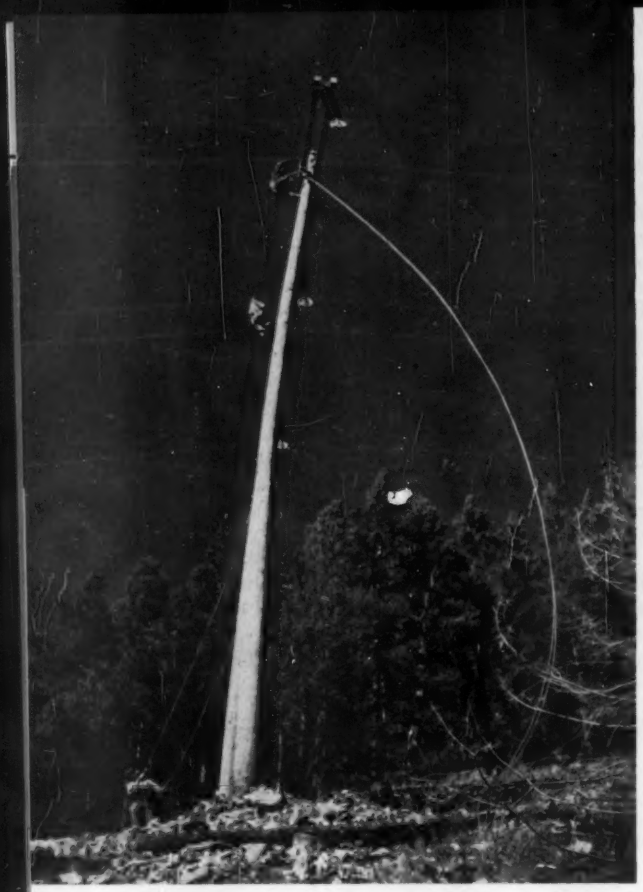
	1	2	3	4	5	6	7
Abilene-Ballinger	31	11	3	3(1)	0	0	0
Childress-Shamrock	54	16	9	4(1)	0	1(2)	1

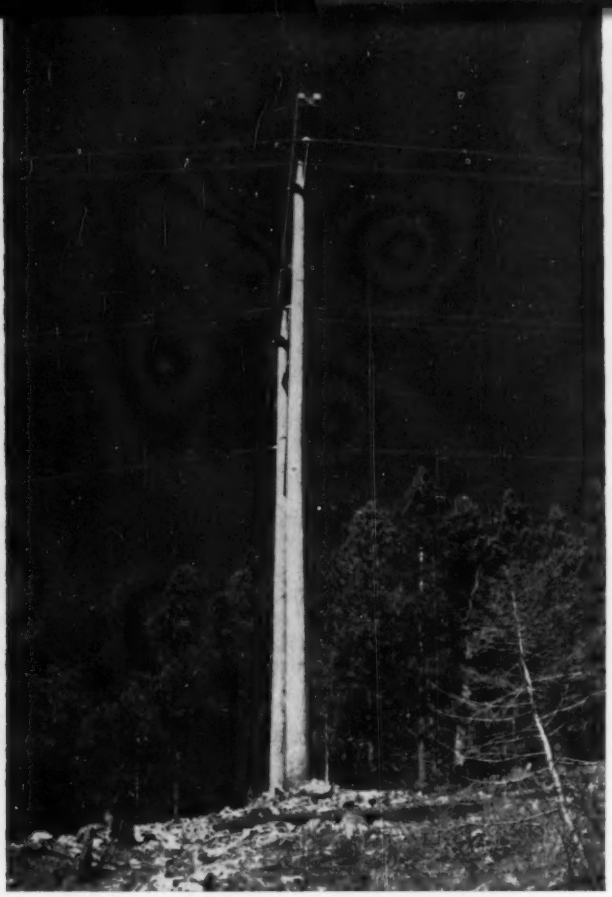
(1) One case was two tubes on a storm guy and one on two adjacent frames.
(2) Two tubes on each of two dead ends and one on two adjacent frames.

Table IV—Outages Attributed to Lightning for Years Shown

	1949	1950	1951	1952	1953	1954
Abilene-Ballinger (53.5 mi)	13	27	23	11	10	14
Childress-Shamrock (56.3 mi)	49	43	43	21	25	19*

*Some tubes installed during 1954.





To hold unguyed pole lines on hillsides straight author tells . . .

How To Apply Clipping Offsets

PHILIP C. EVANS,* Engineer, Montana Power Co, Butte

Application of clipping offsets and sag corrections to transmission spans traversing steeply inclined hillsides will facilitate the clipping in of the conductor. This is especially true for wood pole lines which must be put straight after being pulled off vertical under sagging tension. Where severe icing may occur on hillside spans, application of offsets can be the decisive factor in the continued operation or failure of a section of line.

Simpler Approach is Presented

Use of a short method adopted by the author for calculating clipping offsets and sag corrections by field personnel will help disprove any contention that these computations are as difficult or laborious as first might be thought. This method includes the best features of the method developed by John M. Huston (EW, June 2, 1952, p 86-89) and the method devised by A. W. Adams, transmission design section, Bonneville Power Administration (BPA Dwg 8450). Because application of offsets and corrections is handled primarily by field personnel, this somewhat simpler approach meets a need not answered by the above and earlier approaches from a thorough but mathematical basis.

When the terrain indicates a need for clipping offsets, their importance should not be underestimated. It should be stated firmly that they are to be applied correctly. Because of the slight increase in working time involved in marking and applying clipping offsets, some resistance may be expected from construction personnel. This may follow from a conservative feeling or a reluctance to undertake a procedure not fully understood and appreciated. To overcome any resistance, a discussion of the need for clipping offsets first may be in order.

Referring to Fig 1, assume the conductor is deadended at Structure 1 and pulled over a sheave at Structure 2 to proper tension at Structure 3, with equilibrium at Structure 2, vector $T_1 = T_3$. However, the horizontal tensions H_1 and H_3 are unequal at Structure 2, and at the bottoms of the catenaries in spans 1-2 and 2-3.

Horizontal Moment on Poles

Effect of these unbalanced forces at Structure 2 is diagrammed in Fig 2. Resultant of forces T_1 and T_3 is force I_2 which is transmitted by the insulator string to the crossarm where it resolves into horizonal and vertical components. Vertical component V_2

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is of no concern because the structure is designed to take this downward thrust. But the horizontal component $H_3 - H_1$ tends to overturn the structure in the uphill direction. On a steep incline, and especially for a long series of spans on the incline, this unbalanced horizontal force assumes special importance where unguyed single pole or H-frame structures are involved.

With the conductor in the section in Fig 1 pulled to correct tension at Structure 3, there is the correct total length of conductor between dead-ends. But with unbalanced horizontal tensions, the conductor is not distributed correctly between the two spans. There is too much conductor in span 1-2 and insufficient in span 2-3. To correct this and equalize the horizontal tension, it is necessary at Structure 2 to pull some conductor from the lower into the upper span.

This can be done during clipping in by applying a calculated offset, as shown in Fig. 3. Point S shows the position of the insulator string under sagging tension. If the clamp is attached here, there will be no relief from the unbalanced force. Point P lies vertically under the point of support. Attaching the clamp here will reduce the unbalance slightly. Where offsets are small enough to be neglected, this is the logical clipping point.

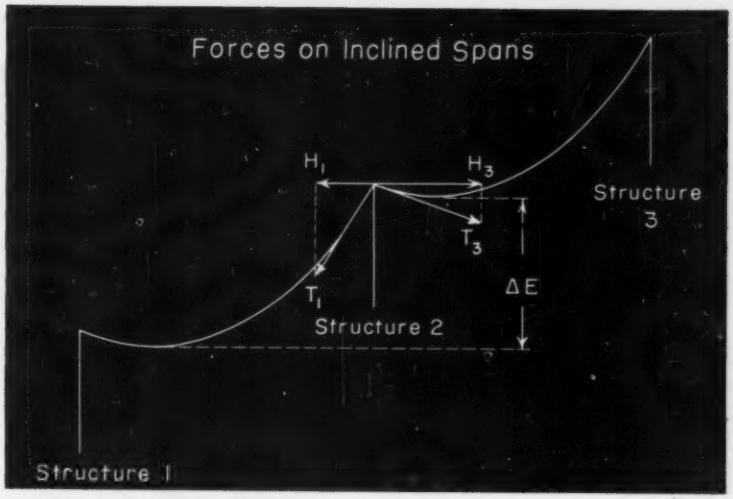


FIG 1—UNBALANCED FORCE in horizontal direction at structure 2 in an inclined section of line will tend to overturn the structure if not corrected. This unbalance is of special importance on unguyed single-pole or H-frame lines

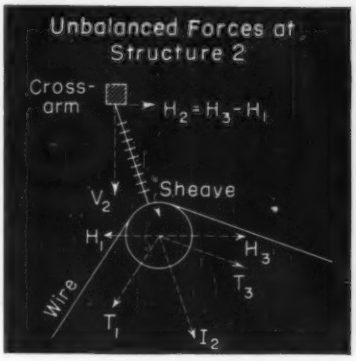


FIG 2 — HORIZONTAL COMPONENT H_3-H_1 can be eliminated by offset

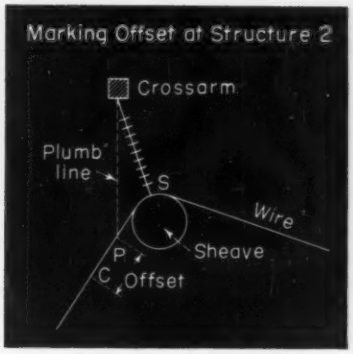


FIG 3—CLIPPING OFFSET is applied by attaching conductor at point C

Offset Equalizes Forces

But clipping at P does not pull sufficient conductor from the lower to the upper span to equalize tensions. It is necessary to measure along the conductor from P a calculated offset P-C and attach the clamp at point C. With the correct offset applied at each suspension structure in the section, horizontal forces will be equalized, and the insulator strings will hang plumb. In addition, any off-vertical structures will tend to straighten themselves during clipping in. If they still require straightening, there is no question of their remaining straight once plumbed, because the overturning moment will have been eliminated.

Application of an offset at Structure 2 will reduce the sag in the lower span and increase it in the upper. Sag in a given span is a direst function of the horizontal tension in that span. Furthermore, application of offsets will equalize the horizontal tensions throughout the sagging section. And final sag, after clipping, must be the correct sag as specified by the design sag table or curve. To obtain correct sag, a calculated correction must be applied to "sag in clamps" to obtain a "sag in sheaves." This latter sag is used in the sagging operation. Sag correction is computed readily in the process of calculating offsets. The correction will eliminate itself when the offsets are applied by the clipping crew.

Compute Corrections

Offsets and sag corrections should be computed for all sagging sections involving large differences in elevation, especially for a long sequence of structures on a hillside. While the need for offsets can be judged by examination of the profile, computation should be made in doubtful cases to determine whether resultant offsets and sag corrections are appreciable. Cases in which offsets can be neglected will depend on the unbalanced tension which can be accepted at a structure. Generally, offsets of less than 3 in. may be neglected. However, in these cases, correction for sag in sheaves may be appreciable, especially in longer spans used as controls for sighting in sag. Sag correction should be applied even when insulators simply are to be clipped plumb.

Selection of a sagging section for offset calculations is influenced by several factors and should be made by the design engineer. But construction personnel should be consulted to allow for field conditions, such as the necessity of snubbing off at a particular point. Offsets and sag corrections are applicable to static wires as well as phase conductors and are similarly calculated. But magnitude of correc-

tions generally will be smaller. Experience will show where it is possible to neglect corrections for static wires while applying them for conductors.

Method Covers Majority of Cases

A short method for computations is illustrated in the accompanying form. Slide rule accuracy is satisfactory for all computations. The method is based on certain approximations which limit its effectiveness under extreme conditions. It will give satisfactory results wherever the offsets do not exceed 15 in., which covers the majority of cases. Beyond this point a more precise method should be used, such as the one outlined in BPA Dwg 7113.

Prior to making calculations, certain data must be obtained, from which constants as shown in the form are determined. These data are entered in the "Conductor Data" section and include:

MWT—Maximum working tension at design temperature, plus ice and wind loading.

Sagging temperature — Estimate ambient temperature for working date in round figures.

W—Total weight of bare conductor per foot.

H_o—Horizontal tension from design office sag data at sagging temperature. Offsets calculated for an assumed sagging temperature, for practical purposes, equalize horizontal tensions for all operating conditions.

A—Cross-section area of conductor in square inches.

E—Modulus of elasticity of conductor for sagging temperature and tension.

Use of Field Form

Referring to Column 0 in the form, odd-numbered lines refer to structures and even-numbered lines to spans. Enter stand numbers for the sagging section in Column 1, commencing with the deadend or last clipped structure of the previous section. End with a deadend or the last structure to be clipped in the sag.

Normally a sagging section will fall between two deadends. However, any snubbing point will do as long as this point refers to the last structure clipped in and not a point where conductors are snubbed to the base of a structure. It is best to terminate a sagging section at a structure where the offset normally is not severe, such as at a point where the profile levels off.

Sample Calculation

0	1	2	3	4	5	6	7
Line No.	Stand No.	(a) Span length, ft	Elev. "L.P.", ft	(Elev. "L.P.") −(datum), ft	Rate of change of length, in./ft	Change in length, in.	$\frac{H}{W} - \frac{Ho}{W}$, ft
	Parenthesized numbers refer to column numbers				$\frac{W^3 a^3}{Ho\ 3}$	(4) (5)	$(4) - \frac{\Sigma(6)}{\Sigma(5)}$
1	721						
2		850	5828	28	0.003285	0.0920	− 387
3	722						
4		650	5872	72	0.001469	0.1058	− 343
5	723						
6		750	5899	99	0.002255	0.2233	− 316
7	724						
8		600	5928	128	0.001155	0.1479	− 287
9	725						
10		1850	5948	148	0.033850	5.0200	− 267
11	726						
12		710	6071	271	0.001915	0.5190	− 144
13	727						
14		690	6482	682	0.001757	1.1980	+ 267
15	728						
16		300	6632	832	0.000144	0.1198	+ 417
17	729						
18		1675	6676	876	0.025200	22.1000	+ 461
19	730						
20		205	6959	1159	0.000046	0.0534	+ 744
21	731			Σ (5)	0.071076		
					Σ (6)	29.5792	

Enter in Column 2 the horizontal span lengths to the nearest foot as obtained from the profile. Column 3 lists the elevation of the low point of the catenary for each span, as scaled off the profile. If the bottom of the catenary falls outside the support, a sag template should be used to extend the curve.

Column 4 shows the difference in elevation between the low point and the datum elevation shown in the constants section. Any elevation may be used for the datum elevation. The first even 100-ft mark below the lowest sag point in the section is convenient. Figures in Column 5 evaluate the derivative dLw/dH from the basic equations of the parabola. The value is mathematically negative but is treated as positive to simplify computation. The necessary minus sign is introduced in Column 8. Compute the constant, $(W/H_o)^a$, and enter in the constants section. Multiply this constant by the cube of each span, pointing off six decimal places. Total this column at the bottom.

Watch Algebraic Signs

Enter the indicated multiplication in Column 6, pointing off four decimals. Total this column and compute the quotient $\Sigma(6)/\Sigma(5)$. Enter this constant on the right side of the form, rounding off to the nearest integer. Perform the indicated subtractions algebraically and enter in Column 7. Close attention must be paid to algebraic signs from this point on. For Column 8, perform the indicated multiplications, rounding off to two decimal places. The algebraic signs will be opposite to those in Column 7. Values in Column 8 represent the change in length of wire between supports, disregarding elasticity, due to variation in horizontal tension.

In the operation for Column 9, allowance is made for the change in

# of Clipping Offsets and Sag Corrections

8	9	10	11	12	13	14	Conductor Data
Preliminary offset, in.	Elasticity correction, in.	Corrected offset, in.	Final adjustment, in	Final offset, in.	Σ offsets, in.	Correction for sag while in sheaves, ft	
−(5)(7)	$(-)\frac{12Wa(7)}{AE}$	(8)+(9)	$\frac{\Sigma(10)}{\Sigma(5)}(5)$	(10)−(11)	Σ(12)	$\frac{Ho[(8)-(11)]}{8W(2)}$	
							Conductor identification ACSR "Dove" 556.5-26/7
+ 1.27	+ 0.68	+ 1.95	+ 0.03	+ 1.92		+ 1.0	M.W.T. 7880 lb at 15° F
					+ 1.92		
+ 0.50	+ 0.46	+ 0.96	+ 0.01	+ 0.95		+ 0.5	Ruling span 1400 ft
					+ 2.87		Estimated sagging temp. 60 F
+ 0.71	+ 0.49	+ 1.20	+ 0.02	+ 1.18		+ 0.7	W = 0.766 lb/ft
					+ 4.05		H_o = 4380 lb at 60 F
+ 0.33	+ 0.35	+ 0.68	+ 0.01	+ 0.67		+ 0.4	A = 0.5083 $in.^2$
					+ 4.72		E = 8.8×10^6 psi
+ 9.05	+ 1.02	+ 10.07	+ 0.31	+ 9.76		+ 3.4	H = Horizontal tension (conductor in sheave)
					+ 14.48		
+ 0.28	+ 0.21	+ 0.49	+ 0.02	+ 0.47		+ 0.3	Constants:
					+ 14.95		Datum elev. = 5800 ft
− 0.47	− 0.38	− 0.85	+ 0.02	− 0.87		− 0.5	$\left(\frac{W}{H_o}\right)^3 = 5.35 \times 10^{-12}$
					+ 14.08		
− 0.06	− 0.26	− 0.32	+ 0.00	− 0.32		− 0.1	$\frac{\Sigma(6)}{\Sigma(5)} = 415$
					+ 13.76		
−11.60	− 1.59	−13.19	+ 0.23	−13.42		− 5.1	$\frac{12W}{AE} = 2.058 \times 10^{-6}$
					+ 0.34		
− 0.03	− 0.31	− 0.34	+ 0.06	− 0.34		− 0.1	$\frac{\Sigma(10)}{\Sigma(5)} = 9.16$
	Σ(10)	+ 0.65			0.00		
							$\frac{H_o}{8W} = 716$

conductor length due to its elasticity under varying tension. Compute the constant, 12W/AE, and enter on the right side of the form. Perform the indicated multiplications, rounding off to two decimals. Algebraic signs will be the same as those in Column 8. Add entries in Columns 8 and 9 and enter in Column 10. Total this column algebraically. Divide Σ(10)/Σ(5), and enter in the constants section.

Enter the multiplications in Column 11 as indicated, watching the signs. Subtract algebraically for Column 12 as indicated. Commencing on line 3 in Column 13, enter the **successive** algebraic sums from Column 12. Last entry in this column should be zero. Any other number is an index of the accuracy of the computations.

For Column 14, compute the constant $H_o/8W$ and enter on the right side of the form. On the even-numbered lines enter the results of the indicated multiplication. Algebraic signs will be the same as in Column 8. To prepare for sagging, the corrections from Column 14 are applied to the figure obtained from the sag table or curve for the control spans used. On completion of sag, when the section is clipped to the calculated offsets, conductor will be pulled as necessary from one span to the next, and corrections will be removed automatically. Conductor in the clamps will then hang at the design sag.

Clamps Offset from Vertical

Offsets in Column 13 should be summarized in a field notebook before going out to sag, with figures rounded off to the nearest inch. Offsets less than a minimum of 3 in. may be neglected.

Upon completion of sag, a plumb point should be marked on each conductor vertically below the point of suspension at structures involving offsets. Establish this point by sighting vertically up from the center of the pole base, because wood poles may be pulled off vertical under sagging tension. Mark this point with tape before **any** clipping in is begun or before wire is disturbed. Clipping crew then only need measure the prescribed offset from this plumb point to find the clamping position.

As recorded in the sample calculation, offsets in the direction of the first structure listed are positive, and those away from this structure are negative. Clipping in a section where offsets are applied may proceed in any desired order, but structures having offsets must **all** be clipped before any other structures in the section are clipped. Remaining structures then may be clipped in any convenient order, each structure being first straightened as necessary, with clamps being attached where they hang plumb under the point of support.

Bertron Station Has Ideal Site

GENERATION
Design

Houston L&P Co's newest plant is near a load center and adjacent to adequate water facilities so that water shipment of coal is possible should cost of nearby gas increase

P. E. **GOURDON**, Consulting Mechanical Engineer, Ebasco Services, Inc, New York, N. Y.

Sam Bertron Station is the third new steam power plant added to the Houston Lighting & Power Co system since World War II. Its site was selected because economic studies showed it had these advantages:

1. Location near the center of a rapidly growing industrial area where it will tend to improve reliability of service and be a positive contribution to developing the area.

2. Abundant supply of cooling water from the Houston Ship Channel is sufficient for condensing purposes in a station having an ultimate capacity over one million kw. The intake and discharge canals are arranged to provide a circuitous path extending for several miles through bayous and channels. This arrangement is sufficiently long to preclude short circuiting of warm water back into the intake.

Although the ship channel provides an outlet for several streams in this region, it contains brackish water and is subject to reversals in flow because of tidal action. Any recirculation of condenser cooling water, however, is through so long a path as to avoid overheating because of the wide dispersal obtained plus the effect of atmospheric cooling. Water temperatures vary seasonally from 55 to 80F, with a possible 90F maximum.

3. Proximity to natural-gas lines and oil refineries.

4. Adequate railroad facilities.

5. Access from the Houston Ship Channel for bringing in oil or coal barges if future conditions warrant using these fuels. The channel connects with the Gulf Coastal Waterway so that barges can be towed from the Mississippi or Mobile Rivers without having to pass through open water in the Gulf.

6. Desirable ground conditions including an area of one square mile, elevation well above flood levels, and satisfactory load bearing characteristics for foundations.

The first 165,000-kw unit went on

the line in March, with a similar unit scheduled for late 1957 or early 1958. A 220,000-kw unit in 1959 will bring installed capacity to 550,000 kw. By 1959, 1,464,000 kw of capacity will have been added to the system since 1949 in four new stations. In addition, 423,000 kw of effective net generating capacity has been added, starting in 1947, at three prewar stations. Increases at new and existing sites by 1959 will total 1,887,000 kw, over 7½ times the 249,000 kw effective net generating capacity prior to 1947.

Houston Lighting & Power serves a relatively compact area—approximately 5,600 sq miles in the Texas Gulf Coast Region—in which are located Houston (largest city in Texas and twelfth in the nation), Galveston, and 151 smaller cities and towns. Estimated population of the area is 1,340,000 as against 700,000 in 1940, representing an increase of 91% as compared with an estimate of 24% for this period for the United States as a whole.

Six Feedwater Heaters are Used

The first two turbines of the Sam Bertron Station are both rated 156,250 kw at 3½-in. Hg back pressure. However they are expected to have an effective net capability of 165,000 kw at 1½-in. Hg back pressure. At 85% power factor the generators are rated for 176,470 kva at 0.5 psig hydrogen pressure, 202,941 kva at 15 psig, and 221,000 kva at 30 psig. Other generator specifications are 20,000 v, 3-phase, 60-cycles, and 0.8 short-circuit ratio.

These are tandem-compound 3, 600-rpm units with throttle steam conditions of 1,800 psig 1,000F and reheat to 1,000F at a crossover pressure of about 500 psig. Six stages of extraction feed heating are provided including a deaerating heater and evaporator delivering vapor to it.

Natural Gas in Area

At present natural gas from the Houston area is the principal fuel for power generation in all the company's stations. Provision also is made at Bertron Station for storing and burning bunker C oil for standby purposes. Fuel-oil unloading equipment with a mooring dock for barges is located near the circulating-water intake structure.

For many years natural gas has been an attractive fuel in this vicinity first because its delivered cost has been substantially lower than coal or oil and second because gas-burning plants cost considerably less to build. No coal and ash-handling equipment, bunkers, pulverizers, or dust collectors are needed. Inexpensive stub stacks replace tall concrete chimneys.

However, rising natural gas prices will bring consideration of other fuels. Because of this, provision was made to convert Bertron Station to burn solid fuel. This is particularly pertinent because Bertron has access to navigable waterways. Coal can be barged from Kentucky and Tennessee or from Alabama by an inexpensive all-water route. Other possible fuel sources are lignite deposits about 100 miles to the north and west of Houston.

The steam generating equipment is designed for conversion from gas to bituminous coal or lignite. Adequate coal-storage areas are reserved in the yard. Ample furnace volume is provided for burning solid fuel, and settings are high enough to permit collection and removal of furnace ash. In addition, the layout is such as not to preclude adaption for burning char from processed coals or lignite.

Steam generating equipment for each unit has a continuous rated

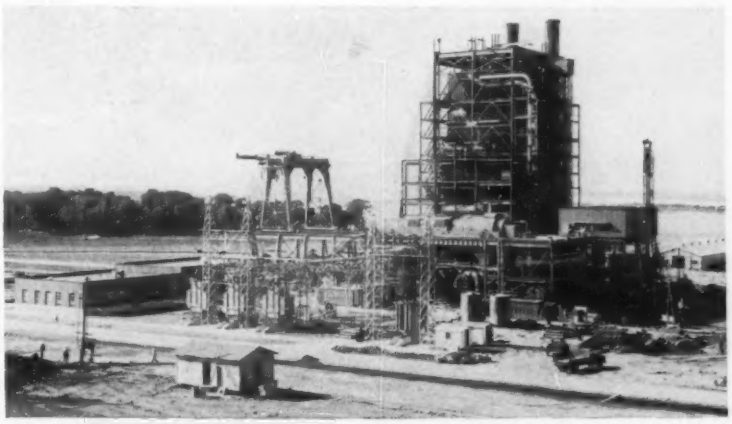
Why Outdoor Construction?

Houston Lighting & Power Co has pioneered in the development of outdoor-type construction for power plants beginning with the installation of a semi-outdoor boiler at Gable Street Station in 1939. In 1943 the first unit at West Junction (now called Hiram O. Clarke Station) was put in service with an outdoor boiler and the turbine-generator placed outdoors under a removable cover where it could be served by a gantry crane.

Greens Bayou Station, placed in operation in 1947, went a stage further in: 1. Confining operation enclosures to a central control room, 2. placing more auxiliaries outdoors, 3. substituting simple end enclosures in lieu of a complete housing over the turbine-generator. These features have been progressively improved at Webster and Bertron stations and have resulted in a substantial reduction in first cost of the stations.

In the Houston area outdoor construction tends for operating comfort as well as reducing first cost. Hot areas such as turbine steam chests, piping, feedwater heaters, boiler casings, breeching, and induced-draft fans cause less discomfort if located outdoors where air circulation is more free. Experience has showed that enclosures for the comfort of operating personnel can be confined to a central control room and locker space.

Shelter for equipment can be kept to a minimum. A concrete deck or canopy over the firing aisle of the boiler instead of a full enclosure can be used. Building maintenance is reduced because there are fewer windows to wash and less floor and wall area to keep clean.



TURBINE-GENERATOR capability is 165 Mw at 1½ in. Hg. Unit is totally outdoors omitting even housing over front end which is optional with outdoor units

steam output of 1,200,000 lb per hour on any fuel considered and a continuous peak output of 1,250,000 lb per hour on gas or oil. Rated steam conditions at the superheater outlet are 1,935 psig and 1,005F, with reheat to 1,005F. The single-drum boiler has a water-cooled furnace, economizer, and two regenerative air heaters. Superheat and reheat temperatures are controlled by series and bypass dampers. Provision is made for the addition of remote manually controlled water-spray regulation of steam temperature.

Expected boiler efficiencies are about 84% with gas firing, 88% with oil, and slightly higher if converted to solid-fuel firing.

Outdoor Plant with Unit Design

Bertron is an outdoor plant. Its design is based on an accumulation of experience which began with the installation of a semi-outdoor boiler at Gable Street Station in 1939.

Unit design is used with a minimum of cross connections, either mechanical or electrical. But certain features are common to some degree, such as fuel supply until it approaches individual boilers; circulating-water intake and discharge canals and chlorination system water-treatment plant; condensate storage system; cooling-water system for turbine lube oil, hydrogen coolers, bearings, etc; compressed-air supply; and spare exciter and standby transformer for the auxiliary power system.

Principal control functions are centralized for each pair of units in a room located at the operating level on the centerline between boilers. This control room is the operating headquarters for these two units. It is enclosed and heated and air conditioned.

Expand in Steps of Two

Arrangement of units for operation in pairs from a single control room with a common operating crew obtains substantial savings in two ways. Field construction costs are reduced where units are installed concurrently or in sequence at one site because it is not necessary to staff two jobs simultaneously or to shift crews from one location to another. After the paired units are in service, both can be operated with only a few more men than would be required for a single unit. Hence incremental operating labor costs would practically double during the period while the units were operated singly.

For these reasons expansion of system capacity usually is planned so as to pick up two steps of system load growth at a single station instead of alternating unit additions between stations. The advantages of this arrangement more often than not outweigh any temporary gains in transmission efficiency that would be obtained through locating successive units in efficiency that would be obtained long-range studies have permitted earmarking locations for single unit installations, such to be carried out when economic and when required by system needs.

In the control room major operational instruments and controls for two units are centralized on boiler-turbine-generator boards where they are under the continual supervision of an operator. Any manual control needed for the boiler, turbine-generator, and their auxiliaries when load changes occur can be performed from these boards. This includes control of switching for the generator and its main and auxiliary-transformer circuits. All switching operations are carried on through circuits actuated from controls on the central boards. Starting panels for the main turbine-generators, however, are located adjacent to the turbines.

Transmission at 66 and 132 Kv

Unit 1 generator feeds through its transformer bank into the 66-kv transmission system which in this area supplies mainly large industrial customers. Unit 2 generator feeds through its transformer bank into the 132-kv transmission lines which are being extended to form a high-voltage loop around the city. Autotransformers at this station form one of the ties between the 66 and 132-kv systems.

Automatic Control Used

The automatic-combustion control, steam-temperature control, and 3-element feedwater control are located adjacent to the respective equipment and function automatically without intervention by the operator except in case of emergency. Observation of turbine supervisory instruments, boiler-drum water level, steam pressures and temperatures, condenser back-pressure, functioning of the hydrogen cooling system, bearing and cooling-water temperatures, etc, are shown on panels in the central control room where alarms are sounded in case of unusual conditions.

Signal lights and annunciators are provided. And there is a communication system between the control room and remote plant stations.

Start and Stop Locally

Manipulation of certain other controls is accomplished from local control panels rather than from the central control room, especially where only starting and stopping operations are required as distinguished from adjustments such as those associated with change in load. In this category are condensate and boiler-feed pumps, and vacuum pumps and circulators for the main condensers.

COMPLETED SWITCHYARD will have both 66 and 132-kv circuits. The 66-kv switchyard shown above uses all aluminum welded bus and galvanized steel structures

A Special Report:

Utilities Fight for New Business with Aid of Area Development

Every 1,000 jobs created in industry add:

- 1,150 jobs in service and supporting industries
- A market for 700 dwelling units
- Purchasers for the output of 250 farm workers
- Customers to support 40 retail merchants
- Increased state tax revenue of more than $100,000

HERBERT R. FRANKEL,
Area Development Editor

Area development is now becoming an important function of electric utilities.

More than 107 companies are now engaged in this work. This compares with only 21 companies in 1949. Today, according to the 1956 "Directory of Electric Utilities," there are 424 private companies. So about one quarter are engaged in this work.

With larger and more efficient units coming onto the lines, electric utilities must find ways to keep this equipment operating. An area development program is one answer.

Most companies stress industrial development. The reasons are many. For every 1,000 jobs a new industry adds, other industries create 1,150 jobs, 700 houses are needed, 250 farm workers must be added and 40 stores opened, and tax collections jump $100,000.

But important too are other factors, such as development of the community, natural resources, and recreation. These are often basic in attracting industry and are reflected in "Guide to Making a Business Climate Appraisal" beginning on page 98. This questionnaire is used by the General Electric Co in evaluating new plant locations.

For a Report on the Four Facets of Area Development Turn the Page

Electric Companies Promote Area

- Communities boost morale as living conditions improve
- Industrial progress brings prosperity as jobs increase
- Conservaion of natural resources betters farming and flood control
- Recreational facilities attract tourists as well as industries

Almost every region, area, or city in the United States today is fighting for more business. Some direct all of their attention to industrial development; others to improve conditions to such a point that per se they become attractive to industries seeking new locations.

Electric companies are titans in this fight. They provide community leaders, civic organizations, industrial planners and locators, and business firms with information, assistance, and cooperation to help improve the economic health of their areas.

Area development is just that—any activity that will improve the economic health of an area. But it can be defined more broadly as active participation in or the leadership of any group activity designed to enhance the economic, social, or cultural level of the area served.

Area development can be broken down into four fields: 1. community or civic, 2. industrial, 3. natural resources including agriculture and conservation, 4. recreation and travel.

Electric companies can profit by planned promotion in all four fields. In fact long-term growth of every electric company depends on the progress made in its service area. Electric companies are deeply rooted in their areas. Unlike other manufacturers they cannot move away. Once

SOIL CONSERVATION starts on the farm. This farmer is examining the soil on his farm which has been entered in soil improvement contest conducted by a power company. Such activities are getting more utility support everyday

Development Programs in 4 Fields

BEFORE the Finer Carolina program of Carolina P&L this town was literally stuck in the mud in more ways than one

AFTER the program paved roads led to other improvements and made Roseboro, N. C., a better place in which to live

they are serving everyone in their areas who wants their product (electric energy), future progress is dependent on area development.

So power companies stand to benefit from area development in two ways:

1. The tangible benefit is the obvious one—the financial gain from more business.

2. The intangible benefit comes from better public relations. Once a company's customers are convinced that the local electric company is out to boost the area they are far more ready to boost it. This can mean public support for new power plant sites, new rights of way, rates that are fair to company and customer alike, and legislation helpful rather than harmful to the company.

Some electric companies see two other benefits. They believe that their area development activities build community leadership. Once the community gets working together on area development, the teamwork is there to attack any community problem. A spirit of self reliance replaces the "let the government do it" attitude. This is the "American Way of Life" at its best.

More Effective Distribution System Created

They also believe conditions are created and information made available to help them design and build better, more effective distribution and electric feeder systems. This can be important in these days when distribution takes such a high percentage of the budget.

These benefits may seem obvious today. But it was not until 1949 with the formation of the Rural and Urban Development Committee of Edison Electric Institute that interest in area development began to mount. Prior to this time the industry was too busy expanding geographically and promoting new uses of electricity to find need for area development.

Following World War II many companies turned their attention to area development as a means of strengthening their territory and getting business for their new power plants. In 1951 the name of the EEI committee was changed to Area Development Committee, and this activity was well under way. In 1949 only 21 companies were engaged in area development work with 57% of these having separate departments. By 1955, the latest year for which figures are available, 107 companies were engaged in the work, and 72% had separate departments.

Agricultural Development Can Be Rewarding

Among the four fields of area development, agricultural development can be very rewarding to electric companies. These utilities have put primary effort in promoting extension of rural lines and greater use of electric power on the farm.

Agriculture is very important to the economy of most areas. Through its thousands of miles of rural lines, the utility literally has its roots deep in agriculture. Through sponsorship and support the utility can stimulate statewide programs such as pasture, dairy herd and livestock improvement, crop diversification, reforestation, and agricultural research.

Though their degree of participation may vary, most electric utilities are active in community or civic development. Such activities have long been recognized for both their public relations value and for their sales value. Without favorable community interest industrial growth will not take place. Tourist and recreational development will fail for lack of citizen participation. Communities will stagnate, and the utility's area will retrogress.

Diverse territories create different problems for each utility. Those in heavily industrialized areas have "bedroom communities" which are not interested in industrial expansion. Heavily populated areas have planning and zoning problems. Rural areas have agricultural problems and a need for industrial growth to balance their economy. All of these areas have need for civic and community improvements to better living conditions for their citizens.

Besides financial contributions to community projects

BEFORE Public Service E&G got on the job, this Bergen County region was "wide-open" for industrial expansion

AFTER PSE&G started promoting, industries grabbed up the sites making up the Bergen County Industrial Terminal

and charities, the most common method of stimulating community interest is to provide speakers for meetings of service clubs and civic, fraternal, and church organizations. While such talks, as a general rule, are directed at some specific field of endeavor, for example industrial or agricultural development or some civic improvement, an express result is the stimulation of over-all community interest. Such programs go far toward creating an awareness on the part of the citizenry for the need for community participation to solve common problems.

Planning and Zone Booklets Should Be Used

Generally used also are publications on topics pertaining to the community. Under this category can be classed industrial brochures, planning and zoning booklets, national magazine reprints, and tourist improvement and advertising pamphlets. Although all of these are designed to sell a particular point, they nonetheless operate in the area of community interest.

But some companies have gone much further. They have set up well-planned, extensive, and long-term programs to build up the communities they serve by helping the people to help themselves.

Most of these programs have as their primary working tool an inventory booklet. After a community group has been formed, (frequently the Chamber of Commerce, Merchant's Association, or some service club assumes this function) it uses this booklet as the basis for a community survey. This reveals the community's strong and weak points. Then a plan for eliminating the weak points is determined. A drive follows to carry out the plan. Sometimes the utility offers cash prizes and other awards.

9 Companies with Well-Planned Programs

Among the companies which have conducted successful promotion campaigns of this type are Arizona Public Service Co, Arkansas Power & Light Co, Georgia Power Co, Carolina Power & Light Co, and Virginia Electric & Power Co.

Programs with the same aim but with different methods of approach have been conducted by Cleveland Electric Illuminating Co, Monongahela Power Co, Pennsylvania Power & Light Co, and Union Electric Co.

Many other companies while not having programs so broad devote intensive efforts toward some facets of community development.

Despite the great diversity of community programs and the infinite variety of the problems involved, there are several underlying principles involved in practically every program. Of prime importance is the fact that in every instance the emphasis is on development at the local level by the people of the community. The basic feeling is that the only real progress which will be made in any area will be that development undertaken by local people —in other words, the so-called "grass roots" approach.

The second important fact is that these programs in practically every instance have enabled the utilities to keep urging participating communities to improve themselves. A reason has been provided for a call-back by the community developer. In Arkansas, for instance, experience has showed that the greatest progress is made when the community counselor is able to return periodically to the communities he serves and ask community leaders what results have been obtained on the program they have laid out for themselves.

Top Management Must Be Sold

Companies planning on entering this field of area development will find that two factors are paramount to the success of such a program. One is that top management must be 100% sold on the need for and the worth of a community development program. Second, sufficient field personnel must be provided to enable the community development department to maintain constant contact with the leadership in the area in which it operates.

Industrial development is king pin among the fields of area development. So important is it that many utilities use the terms synonomously. And the importance accredited to industrial development is well deserved. One company president says, "Here in our area we know that every 1,000 jobs created in industry add:

1. 1,150 jobs in service and supporting industries.
2. A market for 700 dwelling units.
3. Purchasers for the output of 250 farm workers.
4. Customers enough to support 40 new retail merchants.
5. Increased state tax revenue of more than $100,000."

Just what is industrial development? It may be defined as that part of area development that is represented by the increase in "the value added through manufacturing" of the territory. This can be accomplished either by expanding manufacturing industries, by bringing in industries, or both.

The wealth of any area is determined by the amount of new money created within that territory or brought in from outside sources. Payrolls which supply only the needs of a locality do not raise the economic wealth but merely circulate it. The portion of manufacturing for "out of area" consumption is the basic wealth producing means.

Surveys Are Important to Locate Industry

The emphasis to be placed on industrial development by any electric utility can best be determined by a survey of the relative importance of manufacturing industry to the economy of the territory served. This is not always necessarily indicated by the magnitude of the sale of electric power to manufacturers, although it is usually a mighty good barometer. There are areas where manufacturing for "out of area" consumption employs over 60% of all people in this basic field.

The relative importance of manufacturing as determined from the survey can to a degree indicate the effort a utility is justified in putting into industrial development. There is a corollary need which may in some areas outweigh the results of the above survey. That is the need of jobs for people or the utilization of natural resources or products in the area. A survey of basic support of the area will usually indicate this condition along with the importance of manufacturing as of the present.

All Local Organizations Should Cooperate

Having this information, the wise utility seeks out allies, others who also stand to gain from greater industrialization. These usually include chambers of commerce, railroads, real estate agents, industrial associations, and government officials. In many states there are state agencies which will cooperate.

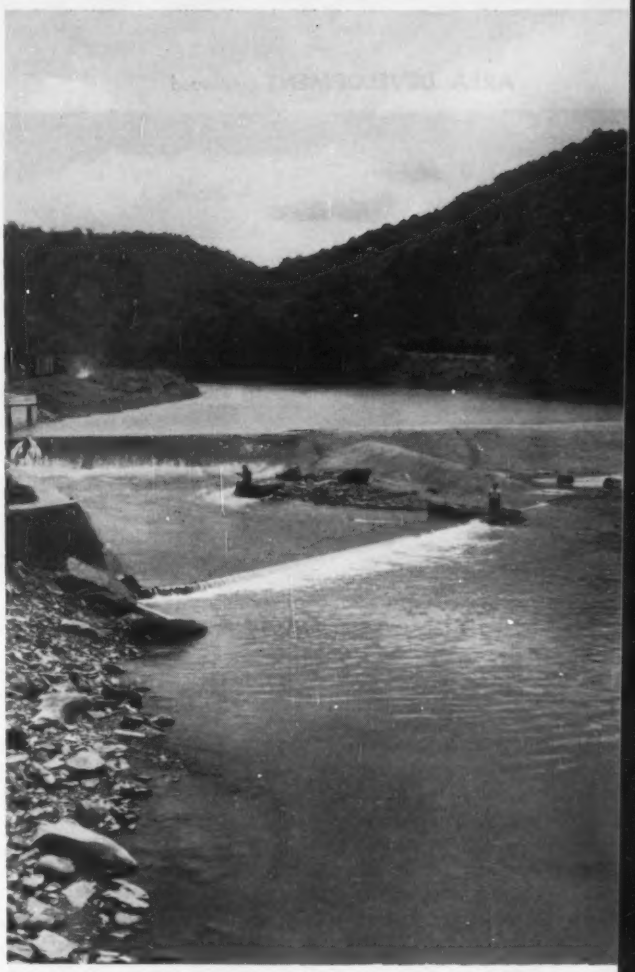
Cooperation of the public at large is especially helpful. If the people are opposed to more industry, sometimes to any industry at all, an educational drive may be necessary to win them over.

3 Spheres of Activity Are Involved

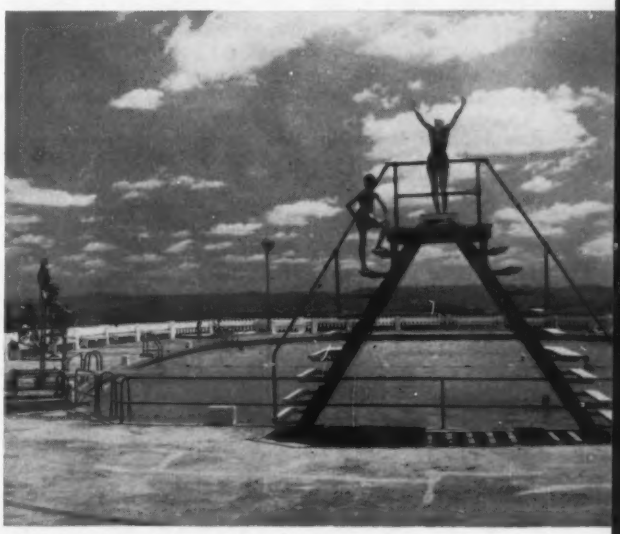
In general three spheres of activity are involved in industrial development: 1. Promotion, 2. Research, 3. Community Development. The emphasis on each of these divisions can only be determined after finding out just what the status of each one is in the particular service area. The utility must remember that its job is to furnish that particular ingredient that is most needed to achieve the end product.

In some areas the utility will find that it must conduct the three spheres of activities. In others it may be involved in only one or two. In communities where other organizations have been working, the utility may only have to act as a catalyst.

The connotation usually associated with industrial development is that of promotion. This involves telling manufacturers what the area has to offer. The mass appeal is usually made in magazine and newspaper advertisements carrying coupons requesting additional information and

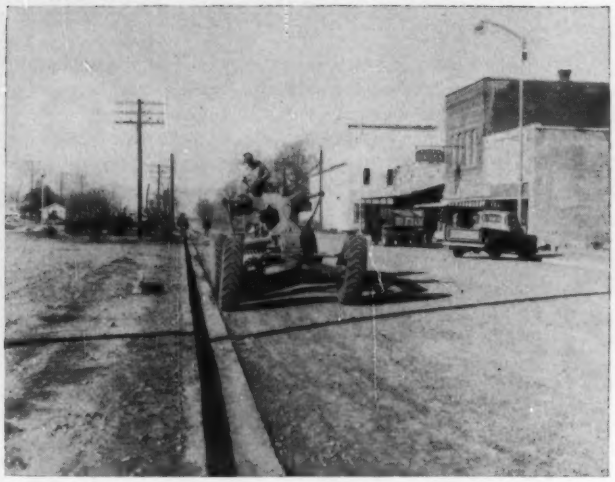


FISHING gets a boost from good sites. Companies having them improve public relations by opening them to public



SWIMMING in the "crick" is passe to today's teenagers. Modern pools are safer and also provide better swimming

Huttig built community park . . .



Hazen paved 68 blocks of streets . . .

literature. Direct mail advertising, personal letters, and even personal calls are used to follow up the coupon requests. The personal follow-up of prospects by qualified persons is probably the most essential part of the program.

In industrial development programs many utilities have had considerable success with a central staff composed of one or more of the divisions previously referred to who work very closely with the company's division or district personnel. This type of organization fills two very desirable requirements. It accomplishes both the benefits of a central group to formulate an integrated policy focused on the job to be done and still makes use of the great knowledge that the local representatives have of the territory they serve. This latter advantage offers the opportunity of making the best use of the public relations value of an industrial development program in the local communities served.

Ads Sponsor Industrial Development

Though most of the work done by industrial development departments is unpublicized and is known only to company officials and a few community leaders, the many advertisements sponsoring industrial development indicate the activities in this field. Favorite publications for such advertising include all metropolitan newspapers and especially those in New York City, such as the "Times," "Herald-Tribune," "Wall Street Journal," and "Journal of Commerce." Magazines favored include "Business Week," like Electrical World a McGraw-Hill publication; "U. S. "News and World Report;" "Time;" and "Fortune."

Closely associated with industrial development is the development of natural resources.

Frequently the conservation of the resources or the intelligent use of them is as important as their development. Today water supply is playing an increasingly important part in the life of both the people and industry. Without an ample water supply an area loses its attractiveness for people, and many industries cannot operate. The utility will derive many benefits from promoting good water conservation practices. A part of this picture is the proper disposition of sewerage. The modern city cannot longer dump its sewerage into an adjoining stream and continue to progress.

Closely allied with water conservation is the promotion of good soil conservation practices and reforestation. The utility can support soil conservation districts in their programs which include the orderly development of the small, upstream watersheds.

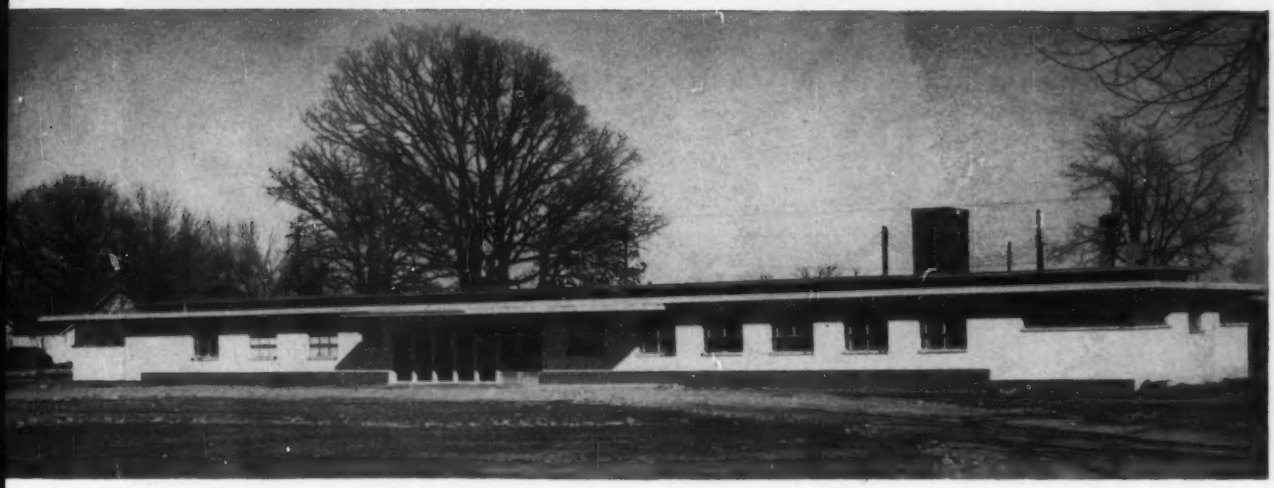
Good forestry practices, including the promotion of tree farming, and the replacement of the renewable timber resources through sound reforestation management, should be encouraged. If necessary, the utility can sponsor such activity. In a number of areas utilities are already taking an important part in reforestation work.

With water and forests has always gone recreation. Fishing, boating, swimming, skin diving are water sports. Hunting, hiking, and picnicking depend to some extent upon forests. In selecting plant sites manufacturers take into consideration the availability of nearby recreational areas because they play an important part in maintaining the morale of employees.

Electric Utilities Develop Recreation

Utilities have been active in developing recreation. Those with hydroelectric facilities have been very generous in providing recreation areas on their properties. Lakes behind dams make possible swimming, boating, fishing, and water sports. On the shores picnic grounds are often maintained. Some companies even allow the erection of cottages on their property so that the public can use them for family vacations.

One company has a recreation counsel who works



Gravette erected a medical center. And all won awards in Arkansas P&L contest

on any phase of recreational development, whether it is a playground, park, ski tow, or community swimming pool.

Today practically every American is a tourist. In general this means, he seeks recreation outside his local geographical area. So travel development has become big business. In years past travel was a summer activity in most areas, a winter activity in a few others. This meant an uneven load for the utility to serve as often it could not be balanced with residential, rural, or industrial loads. Today many utilities are not only promoting their areas to tourists but are trying to promote their areas as year-round tourist spots. Examples of this are Atlantic City which is being publicized to attract the winter tourist, Florida to attract the summer tourist, and upper New York State and New England which are pictured as having all the desirable qualities for a vacation in all seasons.

Companies serving areas having historical shrines have a natural advantage. These spots are often publicized by schools and civic groups to attract visitors.

Also those serving metropolitan areas find an influx of visitors throughout the year. An example of a utility's promotion in this field is the company in a large metropolitan area which has its own convention and tourist bureau, a civic organization supported by private memberships. For two years the president of the utility was president of the bureau and was actively engaged in raising funds so that the bureau could promote the city.

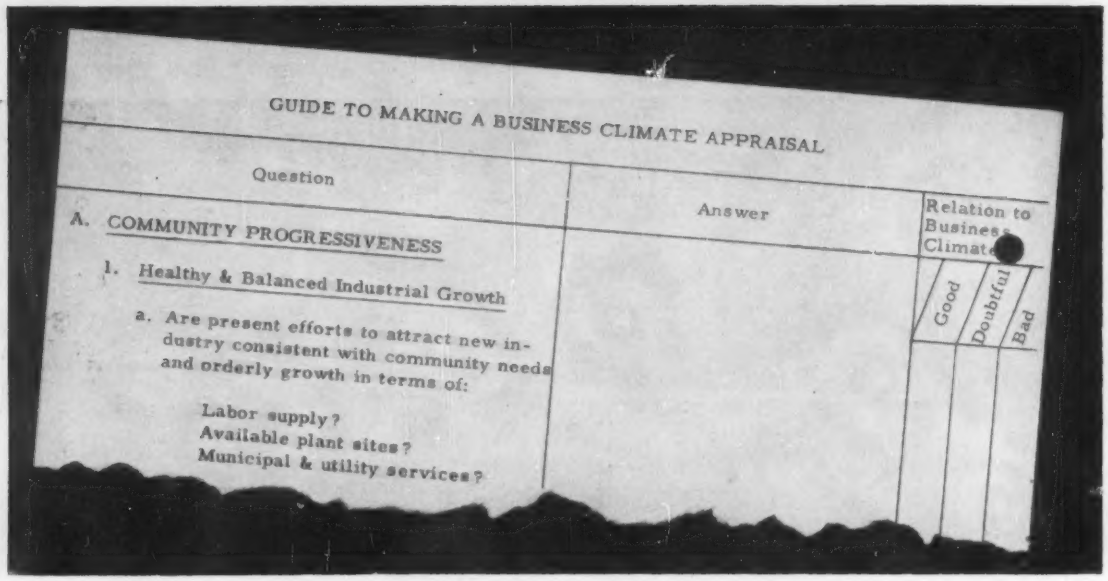
JOHN R. FREDERICK

EEI Committee Assisted in Preparing This Report

This report was prepared with the help of the Area Development Committee of the Edison Electric Institute whose chairman is John R. Frederick, director of industry development, Wisconsin Power & Light Co.

Six members of the committee, John Frederick; Walter I. Dolbeare, vice president, Virginia Electric & Power Co; W. H. Kennedy, Jr, director of industrial area development, Arkansas Power & Light Co; C. S. Cronkright, manager of area development, Public Service Electric & Gas Co; H. L. Brewer, director of industrial development, Consumers Power Co; and S. F. McGowan, director of area development, Northern States Power Co, prepared the original papers on which this special report is based.

Harold Beatty, secretary of the committee and a member of the EEI staff, cooperated by supplying other material, photographs, etc, and by advising on the preparation of the report.


GUIDE TO MAKING A BUSINESS CLIMATE APPRAISAL

Question	Answer	Relation to Business Climate: Good / Doubtful / Bad
A. COMMUNITY PROGRESSIVENESS		
1. Healthy & Balanced Industrial Growth		
a. Are present efforts to attract new industry consistent with community needs and orderly growth in terms of:		
Labor supply?		
Available plant sites?		
Municipal & utility services?		

General Electric Co's 19-Page Questionnaire Helps Companies to . . .

Appraise Local Business Climate

Manufacturer uses this 187-question form to learn favorable and unfavorable characteristics a community may have as a plant site

A 19-page booklet, "Guide to Making a Business Climate Appraisal," has been prepared by the public and employee relations department of the General Electric Co.

It contains 187 questions which every manufacturer who wants to locate a new plant should look over. Electric power suppliers can use this questionnaire to rate the communities they serve. By making such a rating the companies will be better able to plan their area development programs so as to eliminate many of the weaknesses revealed. All the questions are shown on pages 99 to 102.

A favorable business climate, the booklet states, is a composite of such desirable elements as these:

• • •

1. **COMMUNITY PROGRESSIVENESS:** A realistically progressive attitude on the part of political, religious, and professional leaders toward sound community growth and city planning.

2. **GOVERNMENT:** Honest and efficient government, supported by a safe majority of alert, intelligent voters who have the balanced best interests of the community at heart, with an absence of unreasonably restrictive regulations or financial handicaps imposed by the local, state, and federal governments.

3. **LABOR RELATIONS:** A sound working relationship between employers and employees as evidenced by an absence of unwarranted strikes and slowdowns over a number of years and, where collective bargaining contracts are in effect, a constructive and fair union leadership which acts as the servant rather than the master.

4. **PEOPLE:** An adequate supply of people to fill employment needs who have a good work attitude, who are properly educated, who are in good physical condition, and who have a good understanding of how our business system operates and their stake in its success.

5. **LABOR COSTS:** Wage and salary rates and payment methods which are fair to employees, and at the same time provide an opportunity for employers to operate profitably in competition with other manufacturers of their product lines.

6. **COMMUNITY SERVICES AND FACILITIES:** Adequate community services and facilities such as banks, hotels, utilities, shopping facilities, health facilities, and the required commercial services needed in operating businesses.

7. **SOCIAL, CULTURAL AND EDUCATIONAL INSTITUTIONS:** A social and cultural atmosphere that will attract and hold good professional employees, including good and adequate schools, an enlightened press, radio and TV, and an abundance of healthful recreational opportunities.

8. **BUSINESS CITIZENSHIP:** A serious-minded assumption of business citizenship responsibilities on the part of all employers in the community as evidenced by consistently good employee relations and courageous leadership in civic and political affairs.

A. COMMUNITY PROGRESSIVENESS

1. Healthy & Balanced Industrial Growth

a. Are present efforts to attract new industry consistent with community needs and orderly growth in terms of:
Labor supply? Available plant sites? Municipal and utility services?
b. Do population trends provide for a balanced distribution of age groups? For example, is there a tendency for the young people to leave the community or other conditions creating an imbalance?
c. Is the community well diversified industrially?
d. Is the community's economy well balanced with respect to manufacturing, commerce, services?
e. Are the community's industries dynamic and growing, or are they static and declining?
f. What effort is the state making to attract new industry?
g. Does the state offer special inducements to new industry which may work a hardship on established industry?
h. Does the state have a development commission which is just as interested in improving the business climate as it is in promoting the state?
i. Ten years from now, will your business and the community be compatible?

2. City Planning

a. Does the community have a financially realistic long-range program for improvement?
b. Are streets and highways clean, paved, and well planned for growth?
c. Does the city have an intelligent, far-sighted approach to residential and industrial zoning?
d. Are there annexation problems which might create community growth problems for your business?
e. Is the general appearance of the community pleasant and attractive as a place to live and work?

3. Business-Sponsored Organizations

a. Does the community have one or more active, well supported business-sponsored organizations which have accomplished tangible results toward improving the business climate? Will they be able to deliver in the future?
b. Are all segments of the community's industry and commerce represented in these organizations?
c. If the community has more than one business-sponsored group, is there needless duplication of effort?
d. Are the local business-sponsored organizations under the direction of competent and appropriately paid people in terms of the results expected?

4. Housing and Land Development

a. Are there enough houses for present needs: to rent? to buy?
b. Are building and land development costs such that they will enhance or retard the community?
c. Is there provision for slum clearance and rehabilitation?
d. If so, will it be done without state or federal aid?

5. Economic and Political Understanding

a. Do the citizens generally display political awareness?
b. Did more than 35% of the voters go to the polls in the last municipal election?
c. Did more than 75% of the voters go to the polls in the last national election?
d. Is a constant employer effort being made to improve the level of economic understanding in the community?
e. Does a safe majority of the community's citizens understand the importance of the profitability and growth of local industry to their own welfare?
f. Is an undistorted, easy-to-understand, explanation of how the business system operates being given to the youth of the community: in schools, in youth organizations, in such activities as Junior Achievement?
g. What constructive groups devoted to good government are active in the community?

B. GOVERNMENT

1. Administration

a. How would one rate the local administration in terms of the following:
Financial condition?
Honesty?
Efficiency?
Attitude toward business?
b. How would one rate the state administration in terms of the above points?
c. What is the attitude of the State Department of Labor toward business?
d. Are salaries for state and local offices adequate to attract good people?
e. Does a political boss run the town?

2. Legislation

a. How do existing regulations with respect to industrial noise, smoke, odors, waste disposal, etc., affect business?
b. What is the effect of zoning laws on employers and business?
c. Are building codes restrictive and outmoded?
d. Does the state have an FEPC law which contains impractical features?
e. Are there needlessly restrictive state highway or transportation laws?
f. Is it customary for the state legislative body to be a rubber stamp for the party in power?
g. Is there a state right-to-work law?
h. Does the state have a "Little Wagner Act" or other labor laws which put employers at a disadvantage with employers in other states?
i. Do the state laws regulating pay and hours put employers at a disadvantage with employers in other states?
j. Does the state have laws restricting the use of injunctions to prevent unreasonable union acts?
k. Do state professional and occupational licensing laws restrict optimum use of engineering and technical manpower?
l. Are state industrial health and safety laws practical

and reasonable?

m. Are there other regulatory laws which are costly or burdensome to business?

3. Taxation

a. How do corporate taxes in the state compare with other states?
b. What is the outlook for increases in state corporate taxes?
c. How do individual taxes for the state compare with other states?
d. Are townhip or city taxes reasonable?
e. Is industrial property assessed fairly?
f. How does the community compare taxwise and financially with communities where competitors are now located?
g. Are county taxes reasonable and industrial property assessed fairly?
h. Is the corporate share of school taxes reasonable and fair?
i. Are school taxes likely to be increased substantially to catch up with neglected needs?
j. Do employers pay a tax on payrolls, or is there sentiment for such a tax?
k. Is there a city personal income tax?
l. Is there a local machinery and inventory tax?
m. Are there other special taxes peculiar to the community which handicap local employers?
n. Is there any contemplated large expansion of city facilities which will affect tax rates substantially?

4. Law Enforcement

a. Are local courts impartially fair?
b. Does the state provide protection in law enforcement when needed locally?
c. Are the state courts loath to enjoin illegal strikes or picketing?
d. Does political expediency sometimes determine enforcement of laws affecting business?

C. LABOR RELATIONS

1. Labor History

a. What is the strike history of the community? How many work stoppages occurred last year?
b. How many man-days were lost because of work stoppages last year, and what is the trend in this respect?
c. Do jurisdictional disputes occur frequently?
d. If the community has been highly unionized over the years, have these unions been representative of the more radical segments of organized labor?
e. Have there been frequent disputes in the community between unions and employers over how jobs should be classified; for example, whether a job should be limited to male or female employees?
f. Has the community been dominated by one union over a period of time?

2. Union Administration

a. Are local union officials anti-business?
b. What effect have local unions had on employee effort?
c. Are local labor officials governed by the sentiment and wishes of the majority of their local membership, or do they follow the dictates of their national or international officers?
d. Do local union officials tend to act on the basis of logic or on the basis of emotion?
e. Where employees are organized is there wide participation on the part of all employees represented by the bargaining unit; or does a minority determine union policy and action?

3. Local Practices

a. Are union shop contracts accepted practice?
b. Is it customary for employees in the community to insist on working only within closely restricted occupations or crafts?
c. Are featherbedding practices prevalent?
d. Is it customary in the community for union stewards to enjoy special privileges not given other employees?
e. When making plant lay-offs, is it customary among local employers to follow a straight seniority rule?
f. Is there a local union council or similar unifying labor influence?
g. Do secondary boycott practices by local unions hinder business and industrial operations?
h. Is there good cooperation among employers in regard to the exchange of union contracts and other union agreements?

D. PEOPLE

1. Supply

a. Is the labor supply adequate and qualified for our requirements?
b. Is it adequate for all other employers?
c. What percent of the community's labor force is unemployed?
d. Is there an imbalance of labor requirements so that certain types of employees are difficult to find while other types are plentiful?
e. Is the labor force predominantly of one sex?
f. Does this necessarily mean that the opposite sex is available for work?
g. Are there wide seasonal variations in the supply of labor?
h. What percentage of the local high school graduates continue to live in the community?

2. Attitude

a. How do labor turnover rates in the community compare with national averages for similar industries?
b. How does employee effort compare with communities where competitors are located?
c. To what extent do employees in the community abuse special privileges such as coffee breaks and wash-up time?
d. Are good housekeeping practices and responsibility for the care of tools and machinery readily accepted by employees?
e. How do local industrial accident rates compare with other communities and the national averages on an industry-by-industry basis?

f. What is the attitude of the work force to changes in piece-work prices resulting from increased mechanization? Has resistance resulted in the general acceptance of obsolete piece-work prices in the community?
g. Is there evidence of unreasonable employee resistance to technological improvements?
h. What is the community's attitude toward unions and employers?
i. Do juries in the state and local courts reflect favorable or unfavorable public attitudes toward business?

3. Health

a. How does the community's annual death rate per 10,000 population compare with that of the state or of the nation (90.0)?

4. Education, Skill and Training

a. How does the percentage of high school graduates among adults of at least 25 years of age compare with the national figure of 36%?
b. How does the per cent of 16 and 17 year-olds currently attending school compare with the national figure of 80%?
c. How does the percentage of managers, officials, and proprietors in relation to the total population compare with the national figure of 4%?
d. What percentage of the community work force is employed in manufacturing industries?

5. Social Characteristics and Mores

a. Are there restrictions in making job assignments due to racial or other differences?
b. Is there adequate financial support by individuals of community social and welfare agencies?
c. How does the incidence of burglaries compare with the national annual rate of 35 per 10,000 population?
d. How does the incidence of murders compare with the national annual rate of 1 per 20,000 population?
e. How do the average annual wages of production workers compare with those of the state and of the nation ($3,630)?
f. What percentage of the community attends church regularly?
g. Is a stranger from a different geographical location readily accepted into the community?

E. LABOR COSTS

1. Wages

a. Are the wage rates for job classifications higher or lower than in communities where competitors are now located?
b. Are wage rates in the community generally higher or lower than the wage rates in other comparable communities?
c. Do existing local practices in the community hinder the use of wage payment methods best suited to our business?
d. What is the prevailing wage rate practice: Day work rate or incentive rates?

2. Benefits

a. Are extra benefit costs higher or lower than in communities where competitors are now located?
b. Are extra benefit costs in the community generally higher or lower than in other comparable communities?
c. How does the Workmen's Compensation Law in the state compare with other states?
d. How does the Unemployment Compensation Law in the state compare with other states? Is the law administered loosely or fairly?
e. Does the State Unemployment Compensation Law permit payments to employees on strike, employees who have voluntarily quit, employees who have been discharged for misconduct, or because of pregnancy?

3. Special Influences

a. Are local employers subject to constant pressure from one or more high "pace setters?"
b. What effect do "national rate" companies have on the wage rate structure in the community?
c. Do large government installations in the area influence wage rates?
d. Are any such installations under consideration?

4. Other Considerations

a. Based on present wage and benefit trends, what is the five-year outlook?
b. Considering the importance of real wages, how does the cost of living compare with comparable communities in the area?

F. COMMUNITY SERVICES AND FACILITIES

1. Business Services

a. Are the local sources of supplies for plant operations adequate considering the size of the community?
b. Does the community have adequate hotels, restaurants, meeting and exhibit facilities?
c. Are other business services adequate, such as machine shops, postal facilities, job printers?

2. Banks

a. Are local banking facilities adequate to serve the community's needs?

3. Transportation

a. Are transportation facilities adequate to handle incoming and outgoing shipments? Consider truck, rail, air, and water requirements.
b. Are transportation facilities adequate to provide convenient passenger service within the community?
c. Are there adequate parking facilities?
d. Does the local traffic plan facilitate easy movement of motor vehicles?
e. Do public transportation companies cooperate in scheduling good transportation for employees?
f. Is passenger service in and out of town adequate? Consider train, air and bus requirements.

4. Utilities

a. Are utility services adequate to meet business requirements at reasonable rates: Power, water, gas, telephone, sewage disposal?
b. Can these services be extended readily to new industrial plants outside present service areas?

5. Health

a. Are there adequate health facilities? What is the number of hospital beds per 1,000 people? How does this compare with other communities?
b. Are there enough physicians and dentists?
c. Are nursing and health clinic services available?
d. Are there adequate and enforced sanitary laws?

6. Shopping

a. Are modern shopping facilities easily available?

G. SOCIAL, CULTURAL AND EDUCATIONAL INSTITUTIONS

1. Schools

a. Are there adequate facilities for training employees, such as business schools, trade schools, apprenticeship courses?
b. Are there adequate elementary and secondary schools? What is the number of pupils per teacher? How does this compare with the state average and the national average (26.8)?
c. What are the salary levels for teachers in elementary and secondary schools? How do these compare with your state average and the national average ($3,930)?
d. Does the local school system have a vocational training department? How good is the instruction?
e. What higher educational facilities are available?

2. Churches

a. Are there enough churches to take care of community needs?
b. Apart from their religious function, do the churches serve as centers of community activities, and meetings for community betterment?

3. Social, Cultural and Recreational Facilities

a. Are there adequate civic and service organizations, fraternal organizations, social clubs, business and professional societies, youth organizations?
b. Are there adequate recreational facilities: Parks, public golf courses, tennis, theatres, swimming, fishing, boating, spectator sports?
c. Does the community have adequate and up to date libraries, museums, auditoriums?
d. Are there adequate community welfare agencies, mental health facilities, and so on?

4. Press, Radio and TV

a. What local media serve the community: newspapers, radio, television? Are these adequate?
b. What is the editorial policy of the local press and radio toward business?
c. Are union-sponsored radio commentators featured by local radio and TV stations?
d. What effect do nearby metropolitan papers have in the community?
e. If there is a labor press, how does it affect the community's understanding of business?
f. Do local unions maintain an active propaganda program? If so, is their material nationally or locally prepared?

H. BUSINESS CITIZENSHIP

1. Employee Relations

a. Have employers generally provided good management and supervision over the years?
b. Have employers generally improved employment opportunities, wages, and working conditions on a voluntary basis?
c. Is communication between employers and employees effective?
d. Do local employers make a serious attempt to provide steady employment from year to year and season to season?
e. Have most employers demonstrated an understanding of the importance of human relations in their treatment of employees?

2. Participation in Politics and Government

a. Are local business leaders active in serving on legislative affairs committees and other legislative groups?
b. Do the activities of these groups result in constructive action?
c. Are a sufficient number of employers consistently willing to be identified as aggressively for or against controversial issues which affect business?

3. Leadership in Community Affairs

a. Are local business leaders setting an example of personal good citizenship and are they encouraging their employees to do likewise?
b. Do local employers work well together on joint efforts to improve the business climate?
c. Are local employers willing to accept their reasonable share in contributing to charitable needs?
d. What efforts are local employers making to explain their business, policies, and plan in terms of the community's interest?
e. To what extent are local business leaders represented on such groups as the municipal planning commission, school boards, tax councils?

I. NATIONAL ISSUES

1. How do the following national issues affect the business climate in the community and what is being done locally to improve present laws?
a. Taft-Hartley Law
b. Walsh-Healey Law
c. Davis-Bacon Law
d. Anti-trust laws
e. Government competition with business
2. Do your Senators and Representatives in Congress indicate by their actions and voting record a sincere interest and concern for your business climate—even at the possible expense of a few votes?

CONTROL EFFICIENCY and flexibility are typified by this modern control room at the Potomac River Station. Controls are set up for five turbine-generator units. Left to right: Potomac Electric Power Company's Steam Production Superintendent, W. J. Robinson; Electrical Engineer, D. F. Hughes; and Chief Operator, E. A. Howard, discuss panel arrangement.

PEPCO's 5th General Electric unit at Potomac Station helps meet area's growth

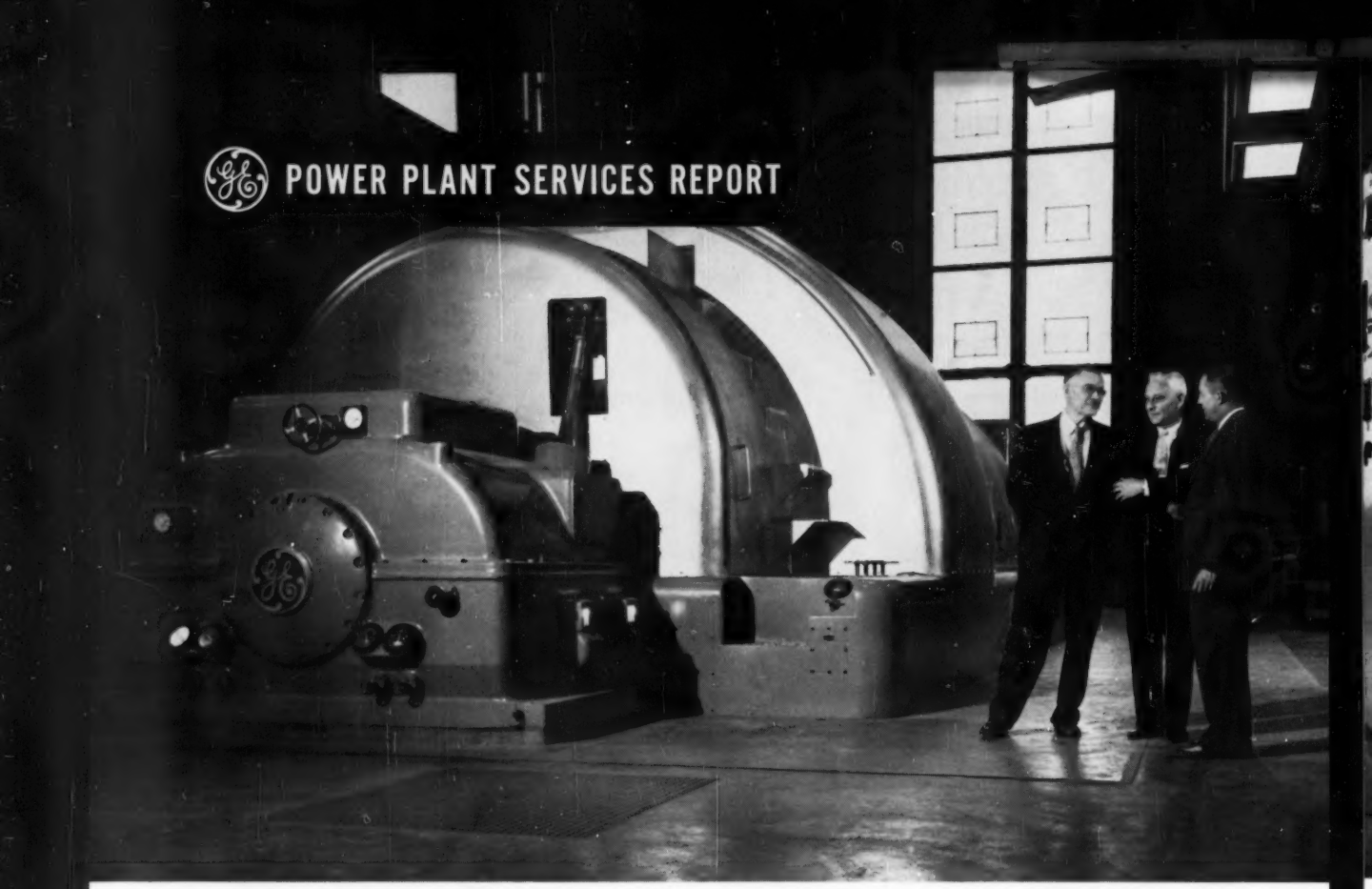
Estimates of the population increase in the Potomac Electric Power Company's service area show a 20% rise since 1950. This was the third highest rate of growth among the 15 metropolitan areas with a population of over one million in the United States. And, growth in the Washington area has given every indication of continuing.

Pepco's System Planning Division has an unusual record of accurate forecasts, and has matched its prediction with balanced expansion programs. Pepco has spent over $100,000,000 since 1950 on construction and expansion. This five-year construction and expansion program reached a high point in 1956 with the delivery of a third 90/100,000-kw General Electric turbine-generator. By specifying General Electric equipment, Pepco and its consultants, Stone and Webster, benefited from General Electric power plant services . . . saving time, money and manpower.

FOR MORE DATA TURN PAGE ▶

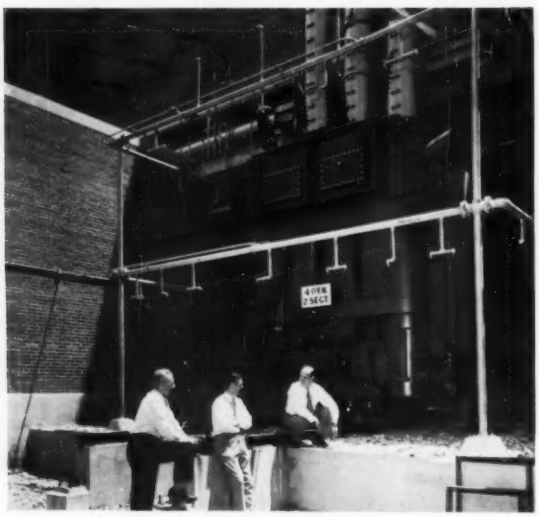
GENERAL ELECTRIC

POWER PLANT SERVICES REPORT



INCREASED CAPACITY for growing load will be provided when unit no. 5 is installed early next year at Potomac River. Unit 5, as well as units 3 and 4 (the one shown here), is 90/100,000-kw reheat turbine-generator with steam conditions of 1800 psig, 1050 F/1000 F. Shown above are L. W. Cadwallader, Pepco Mechanical Engineer; H. J. Sykes, Vice President, Stone & Webster; and W. J. Robinson, Potomac Electric's Superintendent of Steam Production.

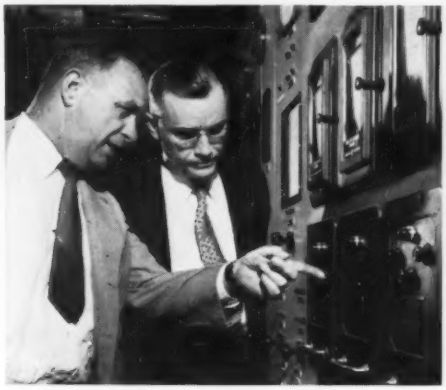
PEPCO'S latest 90/100,000-kw G-E unit



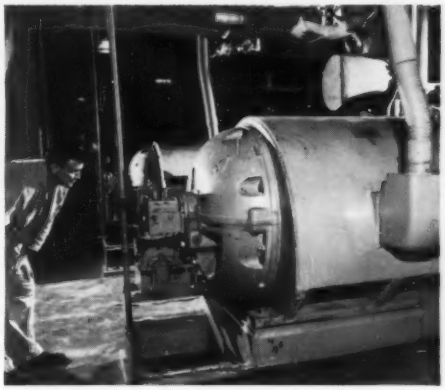
LOWERED INSTALLATION COSTS and on-time delivery of vital equipment like this G-E 90,000-kva power transformer are assured by General Electric power plant services. Another of these units will be installed by Potomac Electric Power Company shortly at the Potomac River Station.

SERVING SUBMARINE CABLE carrying power under Potomac River to Washington, D.C., are these General Electric 69-kv, 2,500,000-kva oil circuit breakers. Discussing switchyard layout are Potomac Electric Power Company's D. F. Hughes, Stone & Webster's H. I. Stewart, G.E.'s F. B. Crider.

PLANNING INSTALLATION of unit no. 5 is a joint endeavor. Here, H. J. Sykes, Vice President, Stone & Webster; D. F. Hughes, Electrical Engineer, Pepco; H. I. Stewart, Construction Superintendent, Stone & Webster; L. W. Cadwallader, Mechanical Engineer and George Bisset, Senior Vice President, Pepco; F. B. Crider, Sales Engineer, G.E., discuss new equipment.



MORE EFFICIENT OPERATION is achieved by General Electric integrated turbine supervisory panel examined here by F. B. Crider, G.E., and L. W. Cadwallader, Pepco Mechanical Engineer.



ASSURANCE AGAINST OUTAGE is provided by 3 boiler feed pump motors per 80,000-kw nameplate rated unit. Pepco Steam Operator L. D. Noland inspects General Electric 800-hp motors.

will boost Potomac River Station capacity 26%

General Electric Power Plant Services help Pepco and Stone & Webster realize lower first costs, higher operating efficiency

Long-range planning at Pepco plays a vital part in determining what steps should be taken to accommodate future growth. The units now in operation at the Potomac River Station are the result of such planning. In 1949-50, two General Electric 80,000-kw nameplate-rated units were installed. By March, 1956, two more of 90/100,000 kw each were operating. Early next year, the fifth General Electric unit at Potomac River will go on the line, bringing the total capacity of the five General Electric units to a nameplate rating of 430,000 kw.

General Electric engineers worked closely with Pepco and Stone & Webster to integrate the design and installation of equipment for optimum station operating efficiency. The same co-ordinated effort will hasten start-up time on unit no. 5 and help keep installation costs to a minimum.

Such application engineering on new equipment is just one of the many power plant services at work on your job when you or your consultants order General Electric apparatus. Product development engineering, field service engineering, and project coordination also help to:

Simplify ordering of equipment purchased either directly or through your consulting engineers, or through a machinery manufacturer.

Conserve engineering time by assisting with electrical equipment details, thereby freeing you and your consulting engineers for other urgent problems.

Integrate equipment design with consultant's plant design to assure the maximum flexibility and effectiveness of operation.

Speed construction by scheduling the arrival and disposition of equipment for maximum installation efficiency and on-time start-up.

Assist in training operators to better understand the full operating capabilities of the equipment.

For details, contact your General Electric Apparatus Sales Representative. General Electric Company, Schenectady 5, N. Y. 302-13

GENERAL ELECTRIC

POWER PLANT SERVICES REPORT

INCREASED RELIABILITY of steam turbine-generators is achieved through improved insulations such as Micapal, which has improved dielectric properties, thermal conductivity and tensile strength. This is typical of G.E.'s continuing research in all types of apparatus for the utility industry.

REDUCED FUEL and man-hour requirements have been made possible with G.E.'s new Automatic Dispatching System, a load frequency control system providing immediate and continuous meeting of load, permitting most economic generation by loading all units to equal incremental costs.

New General Electric product developments help utilities lower operating costs

A multitude of products of wide variety are constantly in development in General Electric's laboratories. Two such advances that have recently emerged from laboratory to useful application are the fully automatic load dispatcher and Micapal insulation. Both these products give excellent promise of lowering utilities' operating costs.

Tireless programs of research, development and product improvement are always under way at General Electric. These programs encompass work on turbine-generators, switchgear, transformers, motors, controls, instruments and other electrical apparatus vital to power plant operation. The goal of this work is to provide the electric utilities with practical means of overcoming rising system costs.

RECORD EXPANSION INVESTMENT

How far will this program go? The answer is dramatically illustrated by the fact that General Electric's record $165 million investment earmarked for expansion of laboratory and manufacturing facilities during 1956 is well on the road to fulfillment.

TEAMWORK IN PLANNING STAGES

As the trends in power station equipment continue to require higher ratings, improved efficiencies, and even greater reliability, the advantage of selecting General Electric apparatus, compounded with time-saving, money-saving benefits of General Electric engineering teamwork, offers electric utilities a striking example of why it pays to call in General Electric early in your planning.

LIVE BETTER ELECTRICALLY

MORE POWER TO AMERICA

GENERAL ELECTRIC

DISTRIBUTION—Operation

Pre-Cut Reflectorized Symbols Give Identity

G. C. DAGGETT, Assistant Superintendent, Electrical Distribution

JOHN HAMMOND, Foreman, Transformer Shop, Public Service Co of Colorado, Denver, Colorado

Pre-cut reflectorized numbers and letters identify transformers and street lighting poles of Public Service Co of Colorado. Such identification offers better visibility, both day or night, and long life. Pre-cut numbers and letters may be placed on transformers in a shorter time than stencilling, or on wood poles with greater ease than branding. Pre-cut adhesive papers eliminate the hazard to linemen of metal plates on wood poles.

Identification numbers on transformers consist of two-color, 1¼ x 2½-in. pieces of paper. Numbers identify the kva rating. Voltage class is indicated by background color—black numbers on traffic yellow, 7.62 kv; silver numbers on red, 13 kv; and black numbers on silver, 2.3 kv. Using the same color system, numbers show service number and cost accounting inventory number.

In the Denver area, Public Service has established a street lighting numbering system that shows the location of the pole (east or west), block number of the district, and position of the pole in the block.

Two-man teams attach pre-cut numbers and letters to poles. The first man shaves a flat area on the leading edge of the pole at a 30-deg angle with the roadway. The area is wiped dust-free and sprayed with an acrylic plastic which sets up in 2 to 3 min. The second man follows from pole to pole attaching numbers and letters. A final coat of acrylic plastic is sprayed over the identification to seal-in and waterproof it. This procedure may be used to identify metal poles too.

Public Service also uses special die-cut reflectorized numbers and letters for vehicle weight identification.

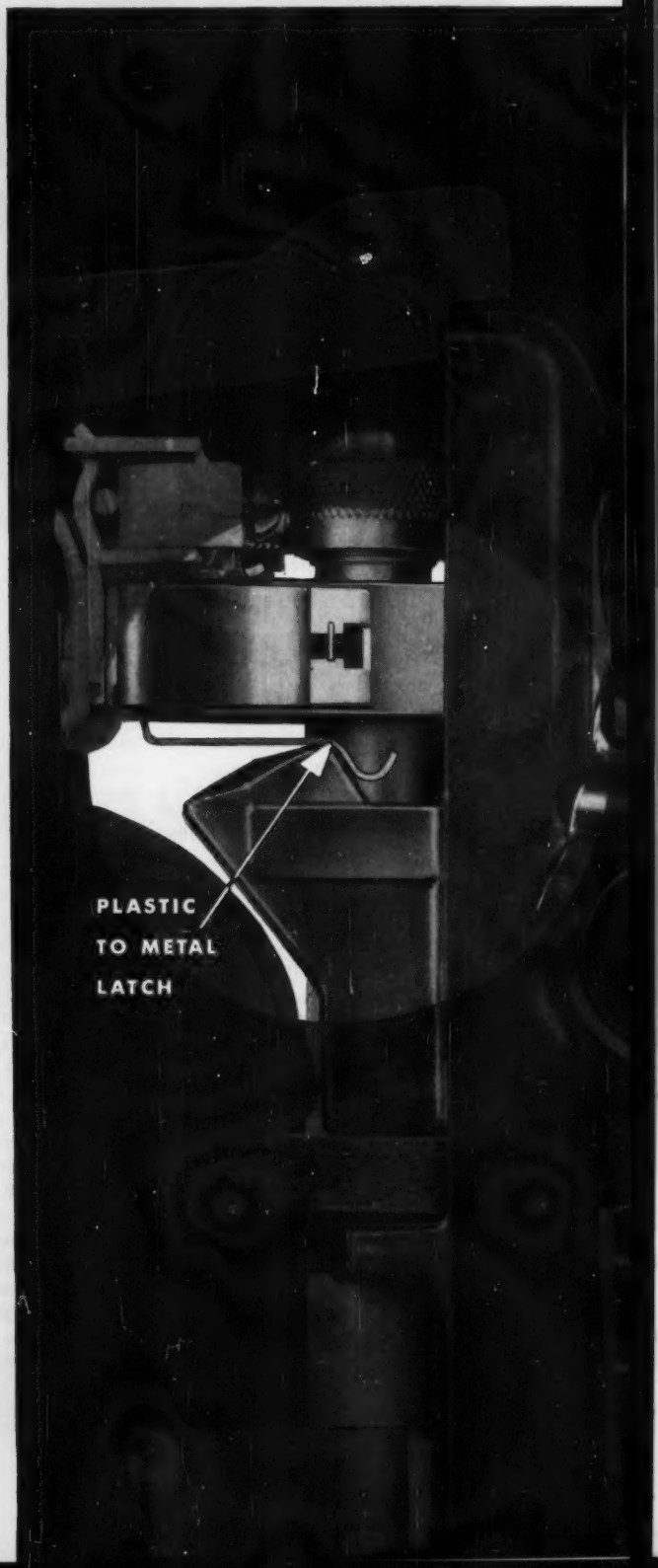
(*More How To on page* 110)

old

Metal-to-metal latching sometimes "seizes" under corrosive conditions. Door may be hard to open.

new

Plastic-to-metal latching eliminates door "seizing" problem. Door opens quicker, easier.



ALL-NEW ENCLOSED FUSE CUTOUTS

now...

Plastic-to-metal door latch assures easier opening prevents door "seizing"

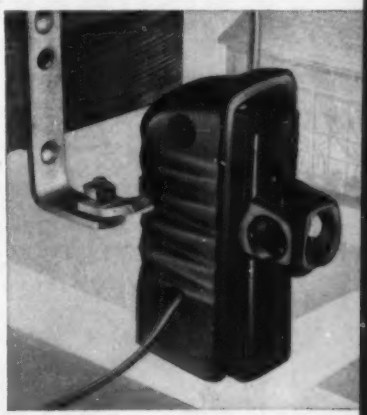
Even after years of service, the doors on all-new G-E enclosed fuse cutouts open easier. Unique plastic-to-metal latching prevents corrosive "seizing" common to metal-to-metal latches. Easier door-opening is assured for drop-out action, switchstick handling, and manual operation.

POSITIVE LATCHING is assured throughout the life of the cutout by latching members of sturdy Textolite* material and long-life stainless steel. Current-carrying parts and latching members are functionally separated and are not required to perform a double duty.

ALL FUNCTIONS IN ONE basic design—G.E.'s new enclosed fuse cutout line gives all functions . . . indicating-dropout, indicating-non-dropout, disconnect—in one basic design. You get two current ratings, 50 and 100 amperes, and two voltage ratings, 5.2 and 7.8 kv, to match every possible system demand.

OTHER OUTSTANDING FEATURES include: the safety-grip door handle, for easier door handling; self-aligning "V"-wedge contacts, that add years to cutout life, and compression-clamped hanger supports, that withstand the roughest shocks. For a complete description of the new cutout line, write for bulletin GEA-6208, General Electric Company, Sec. 433-15, Schenectady 5, N. Y.

*Registered Trademark General Electric Co.

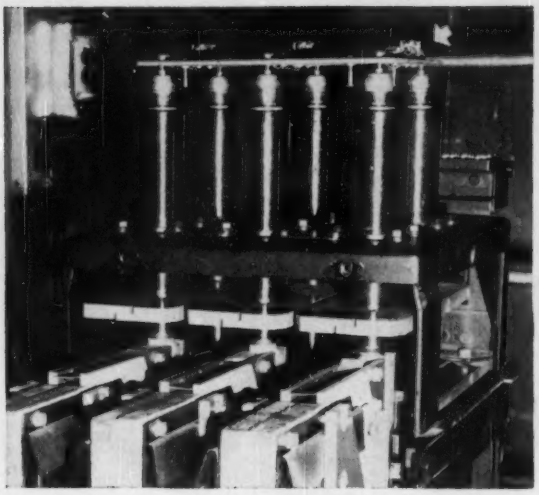


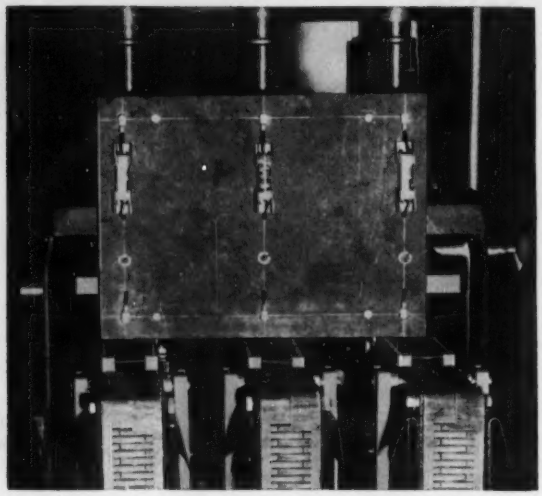
ENGINEERS AND LINEMEN AGREE

The completely new line of G-E fuse cutouts has more of the features they prefer. There's good reason, too—the new design incorporates suggestions made by utility engineers and linemen to G-E sales engineers and specialists.

Progress Is Our Most Important Product

GENERAL ELECTRIC





Magne-Blast ACB Check Saves Man-Hours

AMOS WORKMAN, Maintenance Foreman,
T. E. PEAY, Master Maintenance Man, Kanawha River Plant, Appalachian Electric Power Co, Glasgow, W. Va.

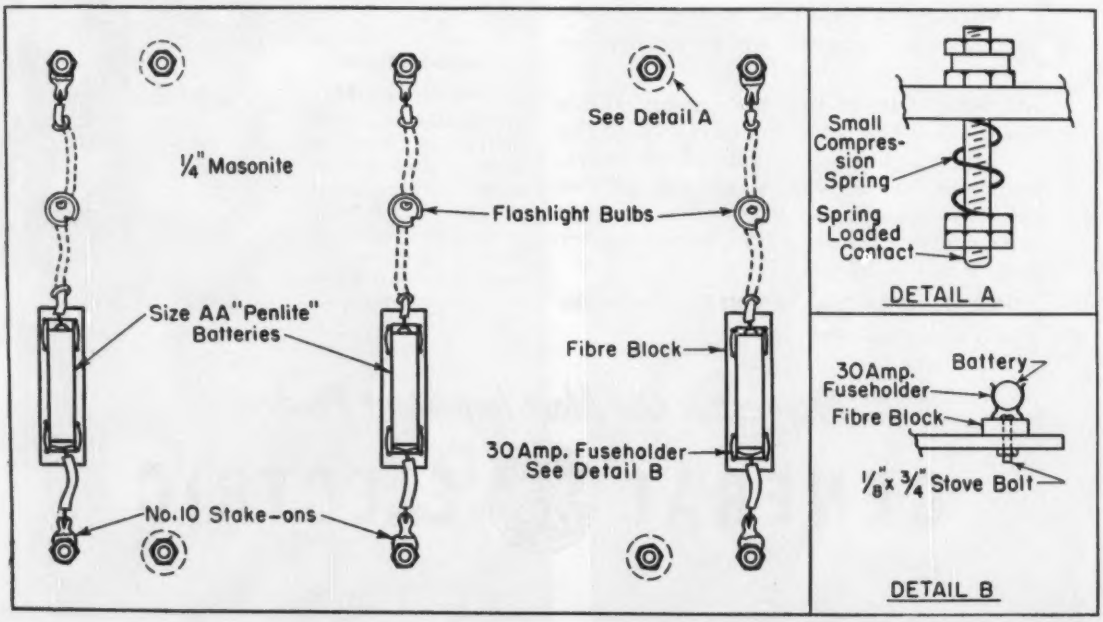
The testing device illustrated saves maintenance personnel some 29 man-hours over the former method of inspecting 70 4-kv "Magne-Blast" breakers at the Kanawha River plant. It was made at a cost of less than $10.

With this device, one man now checks the contacts on an ACB in 5 min. He can operate the maintenance jack while observing the test lamps. A lamp across each pair of contacts lights when the breaker contacts close. For proper operation, all three lamps should light simultaneously.

Much time was formerly consumed during periodic inspections of 4-kv switchgear in checking the contact wipe and other adjustments. With the meter used to check the point at which the contacts closed, it was necessary to move the meter leads from phase to phase each time an inspection was made or contacts were replaced to assure that all contacts were making at the same time.

This check took two men, one to operate the maintenance jack; the other to use the meter. They took 15 min per breaker.

(*More How To on page* 112)



GENERAL ELECTRIC Mobile Unit Substation

PAYS FOR ITSELF by reducing routine system maintenance expense

"We certainly feel that this unit is paying for itself during routine maintenance. Variations in voltage make it adaptable in many locations for a variety of jobs." This statement by Mr. Anthony Zanskas, Assistant Superintendent of Substation Construction and Maintenance, Wisconsin Power and Light, expresses the findings of many progressive utilities.

"Labor and material savings, by using the mobile unit substation for by-passing entire small substations for maintenance and transformer changes have been great, as we have been able to do this work on de-energized busses and equipment with a minimum amount of material and preparation and without any delay or outages." This additional endorsement by Mr. Carl Takle, Wisconsin P & L's Superintendent of Substation Construction and Maintenance, further demonstrates how General Electric mobile unit substations are paying off as a versatile, economical means of speeding routine system maintenance, in addition to their value as stand-by or emergency equipment.

General Electric mobile unit substations are designed for maximum versatility, with provision for various voltage combinations, if required, to meet all application needs. Each substation is a complete, fully coordinated unit, mounted on a high-speed trailer, designed for normal highway operation. For further information, contact your local G-E Apparatus Sales Office or write for bulletin GEA-4415 to General Electric Co., Schenectady 5, N. Y. 422-26

Typical six-months' operating log for Wisconsin P & L's 5000-kva G-E Mobile Unit illustrates high utilization factor. All these stops were for routine maintenance.

Location	Installed	Removed	Days	Mileage
Oregon	2–22–55	3– 6–55	13	25
Tomah	3–10–55	3–16–55	7	110
Prairie Du Chien	3–18–55	3–18–55	1	94
Baraboo	4–19–55	4–23–55	5	98
Fox Lake	5– 7–55	5–18–55	12	35
Janesville	6– 7–55	6–29–55	23	82
Mauston	7–12–55	7–19–55	8	100
Darsel	7–21–55	7–22–55	2	10
Darien	8–11–55	8–11–55	1	120
Portage	8–19–55	8–20–55	2	90
Evansville	8–23–55	8–23–55	1	45

SIX-MONTH TOTALS: 11 Locations
75 Days In Service—809 Miles Traveled

Progress Is Our Most Important Product

GENERAL ELECTRIC

Mechanized Tree-Trimming Operations

Trucks eliminate climbing and reduce brush to chips

Tree trimming operations have been speeded and public relations improved on the Arkansas Power & Light Co system by the use of two new pieces of mechanized equipment.

First of these is the truck equipped with the pneumatically-operated boom that lifts one or two men to the most convenient position for trimming. It eliminates climbing for tree trimming and therefore saves time and eliminates the hazards of climbing. Power tools do the actual cutting of the limbs. The operator simply places the saw blade on the limb to be cut and presses the compressed air lever. The limb is cut quickly and with minimum effort.

Trimming Improved

Quality of trimming has been improved. Special hedge trimmers enable crews to shape trees after trimming. Improved tree trimming means better public relations.

The pneumatically-operated boom reaches 43 ft in any direction from the truck bed.

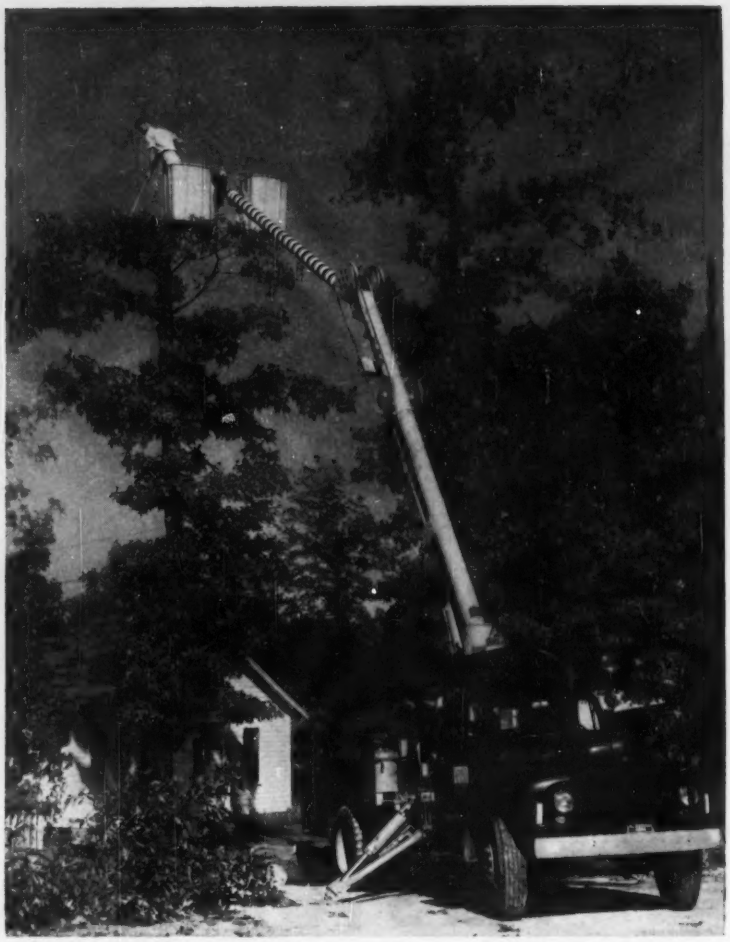
A chipper truck follows the trimming truck. It grinds up the limbs cut by the trimmer truck and saves many trips of the truck for disposing of brush. One load of chips is equal to 15 truck loads of brush. The chipper turns 15 cu yd of brush into 1 cu yd of chips. The truck bed holds approximately 8 cu yd.

Disposal Simplified

The chipper unit is fed from the right side of the truck. It is driven by a power takeoff. A power unit on the left side of the truck operates the unit's hydraulic bed. Branches up to 6-in. dia are ground into chips very quickly.

The chipper unit revolves at 2,000 rpm and is slowed down with a special brake after it has been shut off.

(*More How To on page* 116)

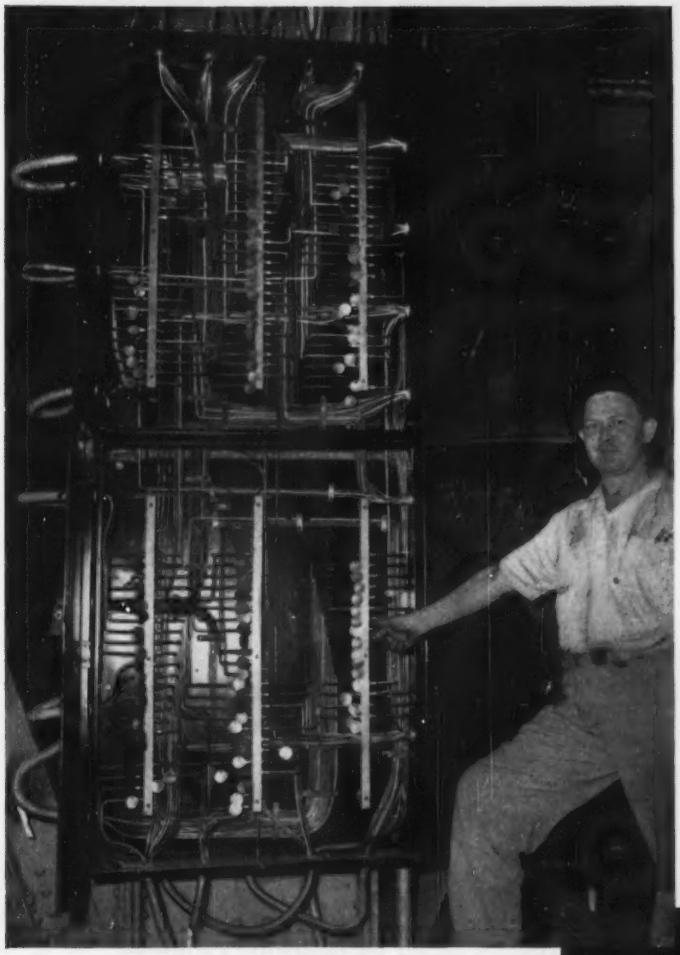


BOOM is operated pneumatically and, together with mechanized tools, improves tree-trimming operations, making work easier and eliminating climbing hazards

CHIPPER UNIT grinds 15 cu yd of brush into 1 cu yd of chips, thus reducing the number of trips formerly required in order to dispose of lopped-off brush

FOR INSTRUMENTATION AND CONTROL

Cabled Tube



Some time ago Revere ran an advertisement featuring Crescent Armored Multitube for use in pneumatic and hydraulic instrumentation and control systems. The advertisement created so much interest that we thought you might like to see a photograph of an actual installation. The Control Board Junction Box shown here has 22 runs of Multitube coming into this box comprising 224 Revere Copper Tubes of 1/4" O.D. The picture was taken in the Glenwood Landing, N.Y. Power Station of the Long Island Lighting Company. The tubes go to instruments that report information on temperature, main and reheat steam pressure, boiler feed and condensate pump pressure, fuel oil and gas pressure, liquid levels, tide level and for the control of fuel feed, draft dampers, boiler drum water level and various control valves.

This is a relatively new use for Revere Copper Tube, but it is an important one in these days when new ways are being found to obtain process information more quickly and accurately, or to achieve automatic control. Crescent Armored Multitube is made by Crescent Insulated Wire & Cable Co., Inc., Trenton 5, N.J., in lengths up to 1,000 feet. It consists of a group of long tubes twisted together in cable form, protected by a flexible interlocked galvanized steel armor, or by plastic, or both. As many as 19 tubes, 1/4" O.D., can be cabled, with one tube in each layer color-coded. Larger tubes can also be cabled, including 5/16", 3/8" and 1/2". This construction affords protection during shipment, installation and use, and speeds up installation greatly. For further information, write Crescent, and for tube in copper and aluminum, see the nearest Revere Sales Office.

REVERE

COPPER AND BRASS INCORPORATED

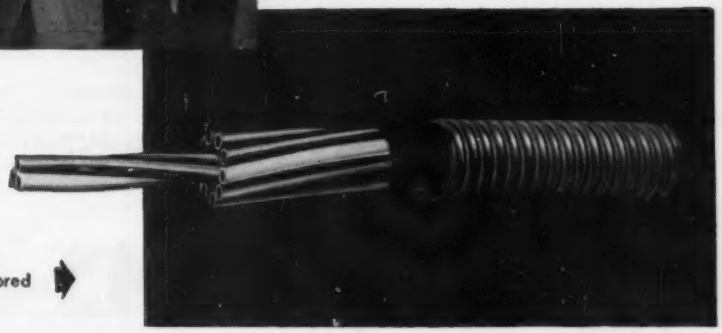
Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.

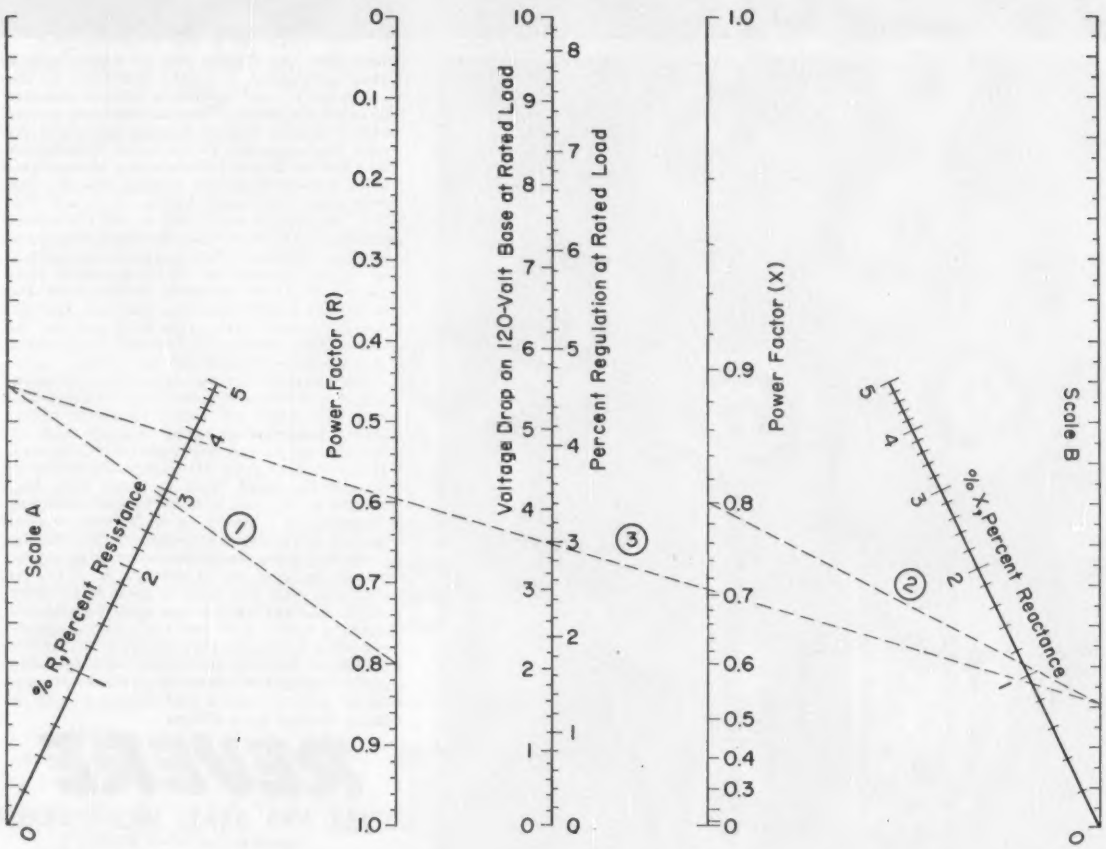
Control Junction Box at Power Station of Long Island Lighting Company, showing use of Crescent Armored Multitube. Note that relatively sharp bends can be made without damage to the cabled copper tube.



Construction of Crescent Armored Multitube.

Chart Gives Voltage Drop and Regulation at Varied Loads on Distribution Transformer

ROLAND W. SCHLIE, Electric Engineering Division,
Rural Electrification Administration, Washington, D. C.



Example for Use of Chart

Find:

Voltage drop and regulation for following conditions

Given:

%R = 2.9; %X = 1.1; Power Factor = 0.8; Load = 125%

Solution:

1. Construct line (1) to intersect %R = 2.9; power factor = 0.8; and scale A
2. Construct line (2) to intersect %X = 1.1; power factor = 0.8; and scale B
3. Construct line (3) between intersections on scales A and B
4. Read intersection of line (3) on the voltage drop scale (VD = 3.58) or voltage regulation scale (Reg = 2.98%)
5. Multiply "percent load" by "voltage drop" and obtain drop in volts (1.25 × 3.58 = 4.5 volts drop)
6. Multiply "percent load" by "voltage regulation" and obtain percent regulation (1.25 × 2.98 = 3.7% Reg)

Graph Based on Following Formulas:

Voltage Drop on 120-v Base at Rated Load =

$$1.2\sqrt{(10{,}000+R^2+200\cdot R\cdot\cos\theta+X^2+200\cdot X\cdot\sin\theta)}-120$$

Percent Regulation at Rated Load =

$$\sqrt{(10{,}000+R^2+200\cdot R\cdot\cos\theta+X^2+200\cdot X\cdot\sin\theta)}-100$$

$$\text{Scale A} = \frac{R^2+200\cdot R\cdot\cos\theta}{10{,}000}$$

$$\text{Scale B} = \frac{X^2+200\cdot X\cdot\sin\theta}{10{,}000}$$

Quality Control at Allis-Chalmers

Checks prevent "Heart Trouble" -mean better transformer performance

● Measuring the dimensions of the coil — the "heart" of a transformer — is step number one at this inspection stage. Compactness of coil and accuracy of dimensions help assure meeting insulation and performance tests.

Cooling ducts are important — so the size, number and location of spacing sticks that form the ducts are checked. In addition, ducts must be clear.

Quality control like this, combined with the finest in materials and workmanship, pays off in performance.

GET NEW BULLETIN, *61B8355, for the complete quality control story. Ask your nearest A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.*

LIVE BETTER ELECTRICALLY

A-C ALLIS-CHALMERS

A-5046

ALLIS-CHALMERS

Contact Tests On CB's Aid Maintenance

R. W. PFEIFFER, Senior Assistant Substation Maintenance & Construction Engineer, Union Electric Co of Missouri, St. Louis, Mo.

A contact resistance check is made before and after each regularly scheduled servicing or overhaul of Union Electric's circuit breakers. The checks detect unsatisfactory contact conditions and defects in current-carrying parts.

Determines Overhaul

A resistance check at the start of a servicing job sometimes indicates that a major overhaul is needed, but it often saves time by revealing that contacts are in good condition. Checks after servicing and overhaul tell whether contacts are in good condition and contact pressures and adjustments satisfactory.

The check is made with a low-resistance ohmmeter reading in microhms.

The meter, using a selenium rectifier or battery as dc source, checks resistance through the fall-of-potential method. The breaker is first removed from its compartment, and its contacts are closed. The ohmmeter probes are placed across the contacts of the disconnecting devices of one pole, the tester making sure that the probes contact metal and that the metal is clean.

Procedure Is Constant

The resistance measured is that of the disconnecting devices and, especially, of the main arcing contacts. The other two poles are checked similarly. Values obtained are compared with values set up through experience with the type of breaker. To be of use, the checks must be made by crews trained in the same procedure.

Inspection Indicated

Normal contact resistance of air circuit breakers ranges from about 20 to 100 microhms, depending upon

(*Continued on page* 118)

AIR CIRCUIT BREAKER of 5-kv, 1,200-amp rating was withdrawn from its compartment for contact resistance check performed with a ohmmeter

OIL CIRCUIT BREAKER of 34.5-kv 600-amp rating gets contact resistance check without lowering breaker tank. Tests reduce maintenance work

The ring of quality

Colorful, low-cost sidewall rings that can be quickly installed on tires are now contributing to the luxury-look of today's new cars. They're inexpensive, stay brilliant for life, wash bright in seconds, out-last tires. A product of The Bearfoot Sole Co., Wadsworth, Ohio, these rings are available in a variety of colors or in white. They're made of Enjay Butyl Rubber because no other rubber tested could equal its performance in severe laboratory and road tests. The Enjay Butyl label on the Flex-A-Wall® carton assures the buyer of outstanding quality.

Find out for yourself the many technical advantages of Enjay Butyl—the rubber that is outperforming natural and other types of rubber in a wide variety of industrial and consumer applications. For full information, and for technical assistance in the use of Enjay Butyl, write, wire or phone the Enjay Company.

ENJAY BUTYL

ENJAY *Pioneer in Petrochemicals*

ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.

Other offices: Akron • Boston • Chicago • Los Angeles • Tulsa

Enjay Butyl is the super-durable rubber with *outstanding* resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.

MR.
LINE
SUPERINTENDENT:

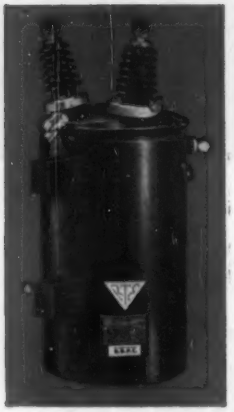
WHAT DO
YOU KNOW
ABOUT
RT&E?

As one of the important men who keep power flowing to the nation's homes and industries, you should know something about one of America's leading suppliers of power equipment.

While we are not the largest transformer builder, we are one of the most dependable. We keep your concern for your men and equipment in mind at all times. A little more care on our part will save time for your men and money for your company.

We have several exclusive features that were either suggested by you, or designed to make the work of your men easier and faster. Our externally operated tap changer is standard equipment; our dual voltage transformer is operated from outside the tank. Maintenance and service calls are minimized by our radio noise-proof construction, high overload capacity and lightning surge strength. Our units are guaranteed for five full years.

Next time your men go out to install an RT&E Transformer, you can be sure their job will be speedy, simple and safe.



RT&E CORPORATION
WAUKESHA, WISCONSIN
Equipment to help provide power for America

Contact Tests

(*Continued from page* 116)

type, rating and manufacturer. Checks have disclosed a reading of 185 microhms on a breaker where normally it should have been 45 microhoms, and 150 when the maximum should have been 30 microhms.

In the latter instance, investigation showed contact burning, improper contact pressures and foreign deposits on contact surfaces. Values were normal after these had been corrected.

Checks during servicing of oil circuit breakers permit determination of the condition of contacts and other current-carrying parts without lowering breaker tanks. When the circuit has been de-energized and the breaker placed in the closed position, the ohmmeter probes are applied to the bushing caps or studs of each pair of bushings, and measurments are made at each pole. Bolted or threaded connections in the resistance path measured are kept to a minimum.

Sludging Detected

Normal contact resistance of oil breakers ranges from about 15 to 600 microhms. Abnormal readings indicate contact burning, oxidation of contacts, faulty contact adjustment, or other defects in the current path.

One very high reading led to the discovery of severe oil carbonization and heavy sludge deposits between bushing sleeves and the lower portion of the bushings. Readings were normal after the sludge had been flushed out, but subsequently all breakers of the same type were inspected. In each case where the breaker had interrupted several faults the same condition was present.

The overhaul schedule for this breaker type was revised to take into account excessive carbonization and sludging.

DISTRIBUTION—Operation

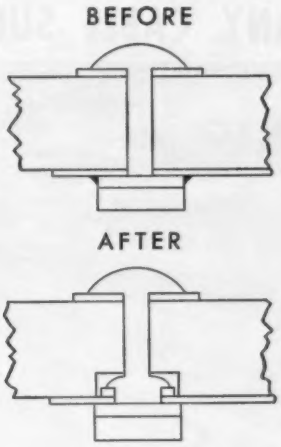
New Trucks Have Special Equipment

R. C. LINDBLOOM, Supervisor of Mobile Equipment, Seattle City Light, Seattle, Wash.

Operating features designed to provide better service have been incorpo-

MALLORY

A change in design recommended by Mallory engineers for a magneto breaker assembly eliminated loosening of contacts in service . . . ended troublesome soldering operation.



Solving Contact Assembly Problems –by Mallory Contact Engineering

The way your electrical contact assemblies are put together is no less important than the materials you use. Mallory contact engineers can give you valuable help in assembly design and manufacturing techniques . . . to gain better performance, simpler production, and lower costs.

Here's an example . . . a breaker contact assembly for an outboard motor magneto. In the original design, the tungsten rivet contact was staked to the phenolic breaker arm. Cold flow of the phenolic material during operation would cause loosening of the rivet, and loss of electrical connection with a steel spring member that was attached between the contact and the breaker arm. To remedy this condition, the contact was soldered to the spring.

Mallory engineers saw an easier way to do the job better. They recommended a new method of assembly, using a stepped shank rivet contact, which could be staked first to the steel spring and then staked to the breaker arm . . . as shown in the illustration. The result—two simple staking operations replaced staking and soldering. And the customer got an assembly that gave better service . . . at economical cost.

Chances are that it will pay you to have Mallory take a look at your own contact designs. By putting our long experience in contact alloys, contact engineering and contact assembly to work, we can come up with interesting savings for you. Write or call us today.

Mallory Contact Engineering Offers Five Ways To Improve Economy

1. **The most effective contact material** from the extensive line developed by Mallory. More economical alloys often can satisfy *actual* service conditions.
2. **The most economical contact design . . .** for your purchasing, production and product needs.
3. **The most economical backing material . . .** from a group of Mallory alloys developed for this use.
4. **The most economical backing member design . . .** in relation to contact and product design requirements.
5. **The most economical method of assembly** of contact and backing member.

By coordinating *all* these important elements of contact design, Mallory can help you put into effect a long-range plan for cutting contact cost and assuring peak performance.

Serving Industry with These Products:

Electromechanical—Resistors • Switches • Tuning Devices • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Batteries
Metallurgical—Contacts • Special Metals • Welding Materials

Expect more . . . get more from

P. R. MALLORY & CO. Inc.
MALLORY

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

COPE EXPANDED METAL CABLE TROUGH THE LOWEST INSTALLED COST OF ANY CABLE SUPPORTING SYSTEM

Cope Expanded Metal Cable Trough is installed in 90% of all major U. S. utilities and is used widely throughout industry.

Note these advantages that are unique with Cope Expanded Metal Cable Trough:

Labor Savings. Quick, simple connections mean faster installation, reduced labor costs. Exclusive Cope Pin-Type Coupler uses only two steel pins and a bottom plate per connection.

Materials Savings. Since far less steel is required than for most types of supporting systems, you save quantities of steel. And fewer, lighter supports are needed.

Improved Electrical Properties. Cope Expanded Metal Cable Trough allows higher cable current ratings. Some engineers allow free air ratings, and all allow higher ratings than are permitted with a solid, enclosed support.

Maintenance Savings. Cable is available for inspection and repair when it is laid in Trough. Insulation is saved by allowing the generated heat to escape and also by greatly reducing frictional wear when cable is installed.

Greater Flexibility. Cope Trough is the most flexible system of cable supports ever designed. A complete line of standard fittings simplifies side runs, drop-outs, last minute changes, plant expansions.

Space Savings. Cope Trough saves space by reducing materials. Confusion is reduced during installation because connections are simpler.

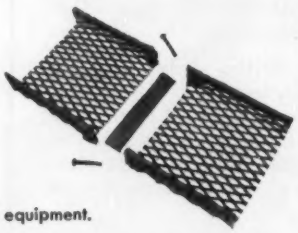
Other Cope Products to Help Simplify Your Jobs:

Cope Cable Ladder is the simplest and least costly system for the support of armored and other semi-rigid cables.

Cope Cable Channel for branch runs is readily tied in with Trough or Ladder System. Both Ladder and Channel incorporate exclusive Pin-Type Coupler.

Cope Rakit Supports are designed specifically for the support of Cope Ladder, Channel, and Trough Systems. Available either with trapeze or the more popular cantilever supports.

EXCLUSIVE COPE PIN-TYPE COUPLER greatly simplifies installations, reduces installation costs, and provides greater adaptability. Pin is driven into interlocking barrels and rigidly secures the connections. Bottom plate protects cable at Trough connections.



Cope Standard Line is a complete line of underground cable installation equipment.

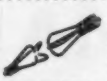
Specify Cope Products for Quality. Our engineers are ready to work with you.

T. J. COPE, INC.

COLLEGEVILLE 4, PA.

Cope

GROUND TENTS



ROD GRAPPLES

CABLE REEL JACKS

PNEUMATIC FISHLINE

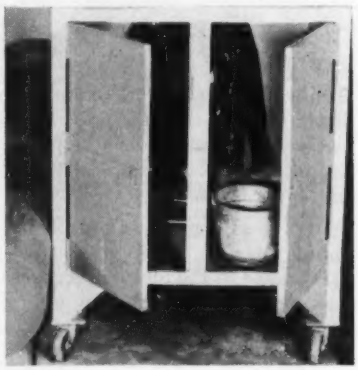
New Trucks

(*Continued from page* 118)

rated into three line service trucks recently added to the fleet of Seattle City Light. Eventually the entire fleet of 25 service trucks operated by the utility will be similarly equipped.

The new trucks are one-ton, dual-rear-wheel vehicles. They have two reels mounted so that cable may be run out parallel or at right angles. Each reel is equipped with a brake. Canopies have openings on either side for better driver visibility and to facilitate handling of tools. A slanting shelf in one opening holds five street lighting relays.

Turn indicators are installed in the rear of the canopy, well above the pavement. They are left in operation when the truck is parked during a service stop, to warn oncoming motorists. Also at the rear of the truck is a loud speaker to amplify radio messages so they may be heard by servicemen even when they are up a pole.



GENERATION—Maintenance

Cabinet-Platform Aids in Condenser Maintenance

Condenser maintenance is made easier at the White River plant of Indianapolis Power & Light Co by a specially devised platform and storage cabinet. The platform and cabinet provides a convenient portable combination which can be used during condenser cleaning operations.

The platform wings attached to each side of cabinet permit easy and

(*Continued on page* 122)

GENERAL CABLE'S HIGH QUALITY CONTROL CABLE with IMPROVED COLOR CODING

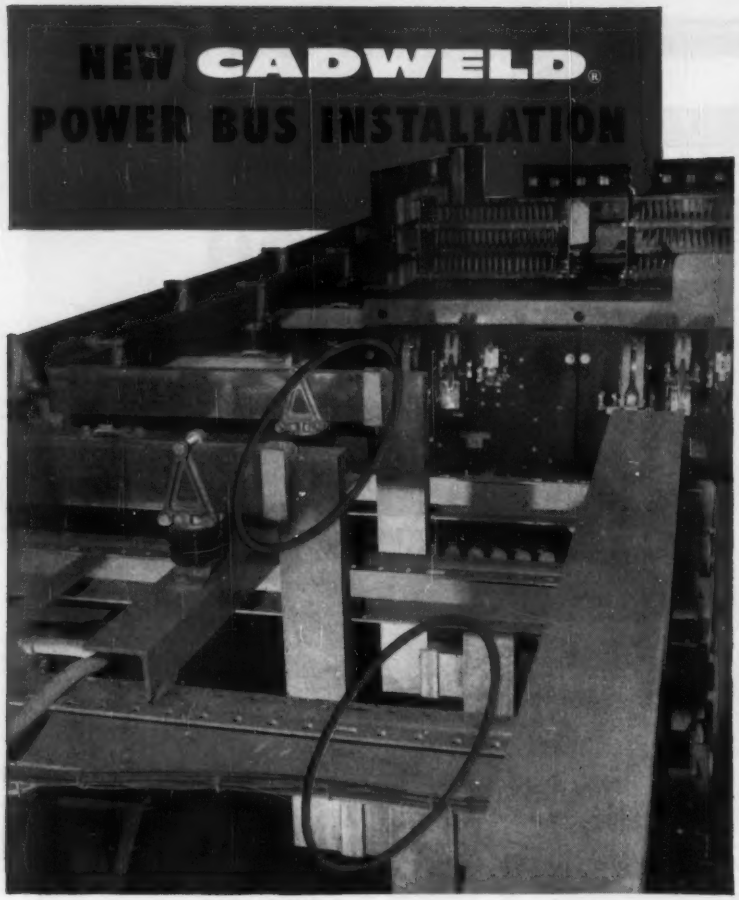
To preserve the superior physical characteristics inherent in black neoprene, General Cable applies a colored synthetic rubber base coating supplemented, where necessary, by spiral striping over the black neoprene jacket of individual conductors.

This new, carefully developed method of color coding the individual conductors of multiple conductor cable results in superior quality, brighter colors and an extra tough coating for permanence.

Station, Traffic, Elevator and Railway control cables are color coded in accordance with IPCEA Standard color sequence and to customer's specifications.

GENERAL CABLE CORPORATION,
420 Lexington Avenue,
New York 17, N. Y.
Offices and Distribution Centers
Coast-to-Coast.

for quality and service . . . specify **GENERAL CABLE**



PATTERSON-EMERSON-COMSTOCK, INC., Pittsburgh Electrical Contractor recently completed an electrical power installation for the JONES AND LAUGHLIN STEEL CORPORATION at their Seamless-Tube Stretch Reducing Mill, Aliquippa, Pennsylvania.

The ¼" x 4", 600V. bus extends from the generator control board to the variable voltage control panel. The panel alternately feeds sixteen 200 H.P. driving motors from a 2000 H.P. motor generator set.

CADWELD **Bus Connections were recommended by P.E.C. to J. & L. for 4 major reasons:**

1. **Economy on original installation.**
2. **100% current carrying capacity.**
3. **Compactness of finished weld.**
4. **Permanent—cannot loosen or corrode.**

Before figuring your next bus installation, investigate **CADWELD.**

CADWELD®

Erico Products, Inc.

2070 E. 61st Place Cleveland 3, Ohio

IN CANADA: ERICO INCORPORATED, 3571 Dundas St., West, Toronto 9, Ontario

Cabinet Aids

(*Continued from page* 120)

safe access to the condenser water boxes. The cabinet provides storage space for tools, boots, hose, buckets, rags and gear for cleaning.

SUBSTATION—Maintenance

Device Speeds Packing of Oil Filter Material

EDGAR JOHN Electrical Foreman, Salt River Power District, Phoenix, Ariz.

Packing of filter material into oil purifier cartridges is done in half the time formerly required with a special packing device used by the Salt River Power District. The device packs at least 5 lb more of material into the cartridges than can be done by manual filling. Thus, the device not only saves considerable man-hours in packing 500 cartridges, but also extends the life of the cartridge in the purifier.

The packer consists of a set of notched steel plates revolving around a shaft, the upper plate or ratchet being stationary on the stand holding the cartridge. The lower half is driven by a ⅓-hp motor. Cam action raises and lowers the upper plate several times per min, firmly packing 38 lb of filter material into the cartridge.

The positive-drop action of the packer gives a positive blow to the cartridge rather than a vibrational effect.

WHEN DO YOU KNOW THEY'RE GOOD ENOUGH?

In EHV applications, shielding devices should perform as good or better than supported conductor arrangement

How high will extra high voltage go? Our research has shown that insulation, conductor hardware and related shielding devices need place no upper limit on transmission voltage magnitude.

Our basic interest in conducting the research shown here is to develop the best insulators and hardware (we make them both) for use with bundled conductors in extra high voltage transmission. The set-up shown is experimental. It's not in use on today's 330-kv lines. But it may well be used on tomorrow's 550 (?) lines.

We design our shielding devices to have radio and corona characteristics that are equal to or better than the best supported conductor arrangement. Smooth tubes were used in this experiment because we know they'll provide optimum corona performance for a given conductor diameter. If our shields and other hardware work as good or better than smooth tubes, we know they'll be corona free when used with stranded conductor.

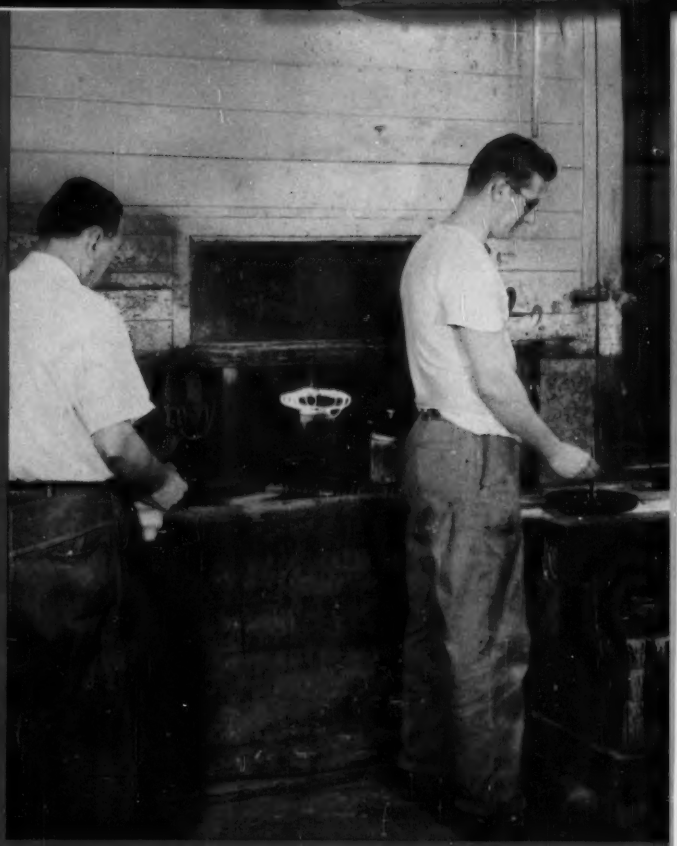
Out of such experiments come other benefits to the power industry. The same technical know-how and facilities that produce answers on hardware and insulator performance have also brought development of a formula for predicting radio and corona characteristics of smooth conductors.*

Other experiments in the laboratory are also designed to anticipate and solve tomorrow's problems in extra high voltage transmission. Meanwhile, more than two-thirds of the EHV miles in North America have been built with O-B insulators and hardware . . . showing that lessons learned in the laboratory can be translated into products that will handle the most exacting transmission jobs.

OHIO BRASS COMPANY, MANSFIELD, OHIO
In Canada—Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

*"Mathematical Prediction of Radio and Corona Characteristics of Smooth Bundled Conductors"—By C. J. Miller, Jr., Ohio Brass Company, presented at AIEE Great Lakes District Meeting, Fort Wayne, Indiana, April 16-18. We'll be glad to send you a copy. Ask for O-B No. 1362-H.

Ohio Brass



High frequency test on reel before assembly.

Combination high and low frequency test of assembled units.

Low frequency test before assembly.

Every O-B suspension insulator runs this

electrical obstacle course . . .

It gets not one, but all three routine tests

Testing, testing, testing. Every working day, 12 men do nothing but test O-B suspension insulators.

Consider just routine electrical testing. Every suspension insulator gets . . .

1—High frequency test before assembly. Known as the "reel" test, this provides two million opportunities for flashover . . . several thousand times the lifetime opportunities presented in the average lightning area.

2—Low frequency test before assembly . . . vigorous dry flashover for five minutes . . . another 36,000 opportunities for flashover.

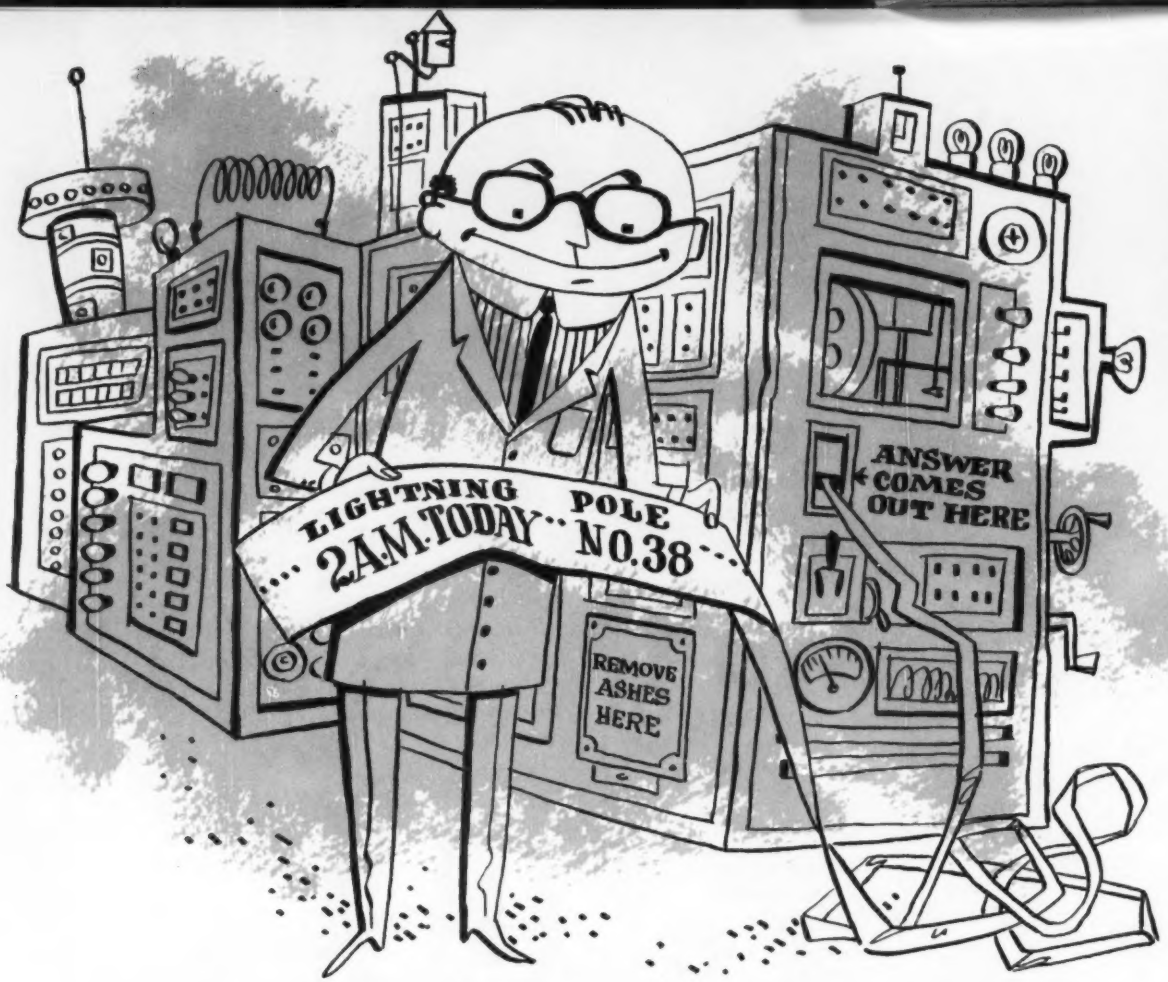
3—Combination high and low frequency test of assembled units with high-frequency voltage superimposed on low frequency . . . and many more opportunities to flash over than it will encounter in a lifetime of service.

Every suspension insulator gets all three electrical routine tests. In addition, design tests are carried out at frequent intervals.

Remember, the tests shown here are electrical tests only. Many other quality control measures are used to make sure O-B suspension insulators maintain their 45-year-old reputation as the most reliable element—electrically and mechanically—between the conductor and the ground line.

To run our electrical obstacle course, suspension units have to be good!

. . . . the heart of every Ohio Brass insulator



Even without a "Lightning-Vac," there's a way to handle outages

As a convenience for distribution superintendents, we advocate development of a "lightning-vac," an electronic device for predicting at which pole or poles (if any) lightning will strike during a storm.

Then a line crew could be standing by at a safe distance. As soon as lightning struck, damage could be repaired, limiting the outage to a few minutes.

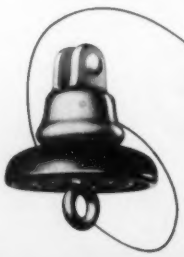
Now let's take tongue out of cheek. What is the best available way to protect rural lines against lightning?

We say it's with O-B insulators. Their ability to withstand lightning has been proved time and again in the field and in the laboratory. We've turned the impulse generator loose on O-B pintypes, for example, and they've withstood man-made lightning that has twice the rate of voltage rise of natural lightning.

Your local Graybar man can provide additional proof of the lightning immunity of O-B insulators. While we're waiting for the lightning-vac, you can reduce lightning outages by insulating with O-B.

OHIO BRASS COMPANY, MANSFIELD, OHIO

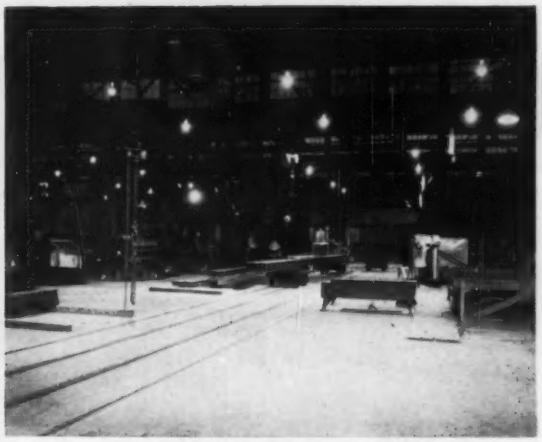
Ohio Brass



GraybaR QUALITY SINCE 1869 REG U.S. PAT. OFF. Distributed by GraybaR ELECTRIC COMPANY

4678-H

Steel Plant BEFORE . . .



. . . Same Plant AFTER

New Lighting Improves Working Conditions

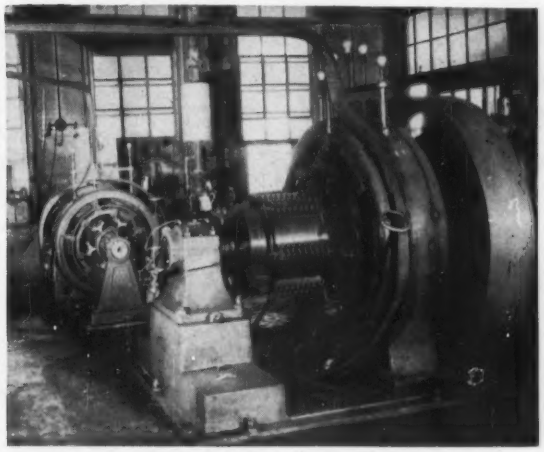
F. P. O'CONNOR, St. Joseph Light & Power Co, St. Joseph, Mo.

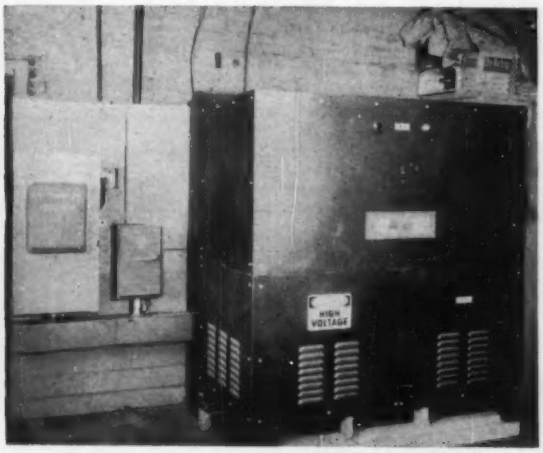
Working conditions were greatly improved at the St. Joseph Structural Steel Co plant by a lighting modernization project.

Before the new lighting was installed there were 20 fixtures and lamp sizes varying from 100 to 300 w. Average lighting was from 2 to 4 ft-c. Electrical load was 4 kw. Energy use was 700 kwhr per month.

The plant was relighted with 40-750-w reflector lamps. Illumination level was raised to 15 to 18 ft-c. Electrical load is now 30 kw. Energy use is 5,500 kwhr per month.

Only changes were in lighting and wiring, and the floor was cleaned.





Equipment Failure Precipitates Switch to Purchased Power

A. L. LAWTON, Power Engineer, New York State Electric & Gas Corp, Elmira, N. Y.

A changeover to 100% purchased power occurred at the Bernarr Macfadden Center, Dansville, N. Y., when the hotel's dc powerplant failed. Steps already had been taken to convert a hydraulic elevator and certain power plant auxiliaries to NYSEG power. The balance of the 100-kw load was picked up through a selenium rectifier when the power failure occurred. Anticipating an eventual changeover to purchased power, NYSEG already had built a line and transformer bank with sufficient capacity to assume the full load.

Get 3 Tanks for best protection

1

It Takes More Than One Tank for That Extra Margin of Protection

Here's big breaker construction in a small outdoor distribution breaker! It costs you no more, so why take less?

Compare this breaker with others of the same rating and see the difference. Allis-Chalmers breakers offer:

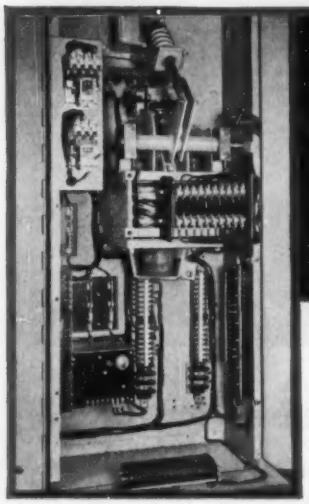
Tank-per-phase construction — Phases are completely isolated to eliminate internal phase-to-phase flashover and provide maximum protection on today's low reactance systems with their corresponding high fault currents.

Two vertical breaks per phase — Using time-tested *Ruptor* devices.

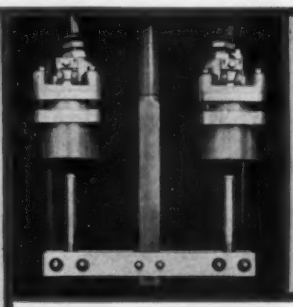
Standardized control wiring — Wiring meets NEMA and AEIC standards. Permits breaker to be moved from one location to another without the need for complete rewiring, as in the past.

Get More Information! For the complete story call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

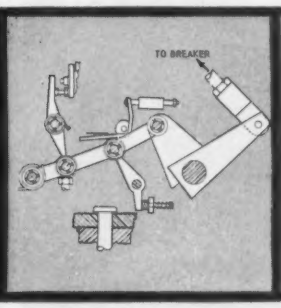
Ruptor is an Allis-Chalmers trademark.



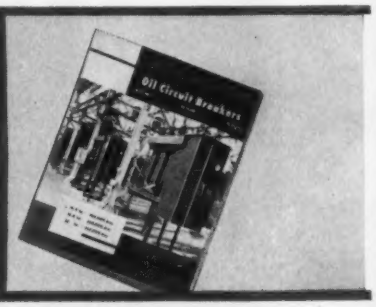
AEIC-NEMA standardized control wiring facilitates changing external control scheme to meet individual requirements without changing basic internal wiring scheme.



Two vertical internal breaks per phase... features time-proved, fully tested *Ruptor* interrupting devices with self-wiping, self-aligning tulip and bayonet contacts.

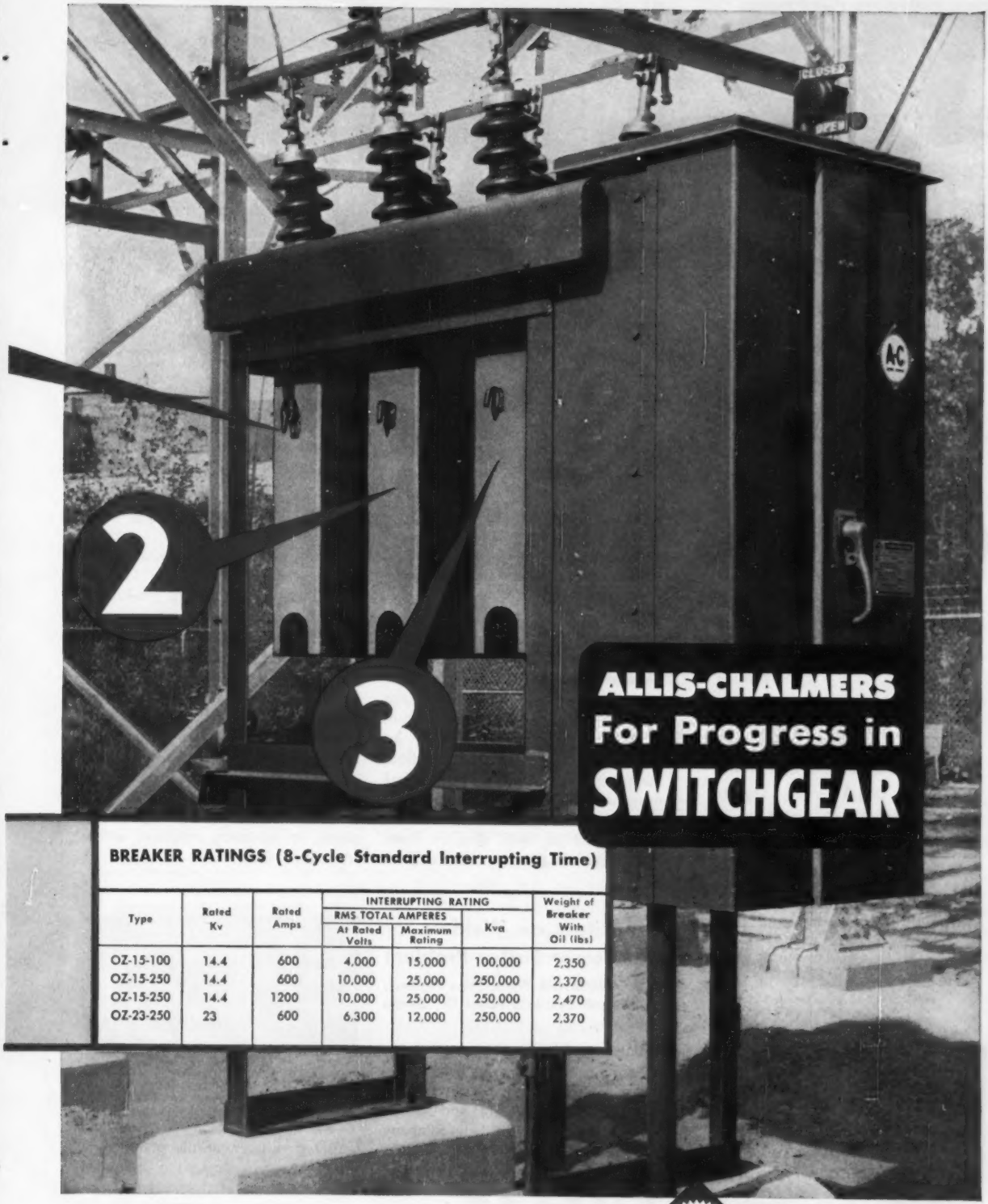


Four-bar linkage like ones on large A-C breakers provides mechanically trip-free operation. Simple solenoid operator—factory-set shim adjustments cut maintenance.



Eight-page bulletin 71B7946 tells the complete story. It shows the many quality features ordinarily found only in the larger breakers built into these units.

ALLIS-



BREAKER RATINGS (8-Cycle Standard Interrupting Time)

Type	Rated Kv	Rated Amps	INTERRUPTING RATING			Weight of Breaker With Oil (lbs)
			RMS TOTAL AMPERES		Kva	
			At Rated Volts	Maximum Rating		
OZ-15-100	14.4	600	4,000	15,000	100,000	2,350
OZ-15-250	14.4	600	10,000	25,000	250,000	2,370
OZ-15-250	14.4	1200	10,000	25,000	250,000	2,470
OZ-23-250	23	600	6,300	12,000	250,000	2,370

CHALMERS

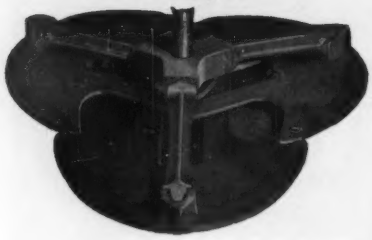
A-C ALLIS CHALMERS

A-5144

The Old Reliable

EVERSTICK ANCHORS...

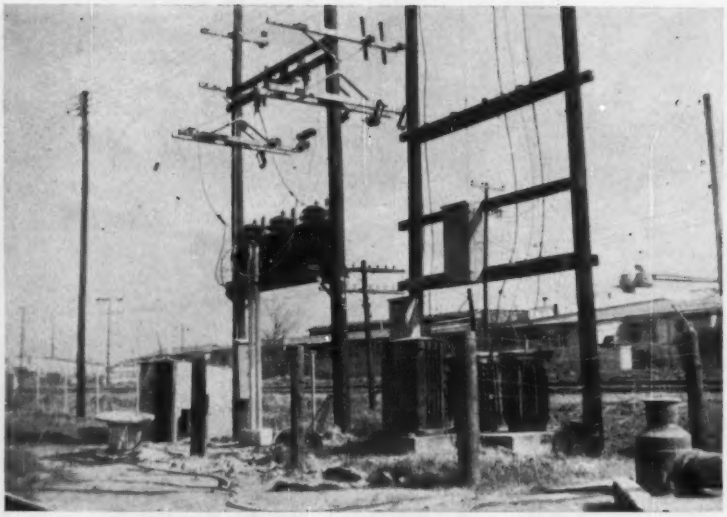
EXTRA Holding Power
QUICKLY Installed
TOUGH For long life



● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all other. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE EVERSTICK FEATURE
Exclusive Everstick nut housing Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO
FAIRFIELD, IOWA



NEW 13 KV/440-V tranformer bank, left, feeds load centers in the plant through two underground plastic-covered conduits. Old installation is at right

New System Cuts Maintenance Costs

C. D. ANDERSON, Power Sales Engineer, Savannah Electric & Power Co, Savannah, Ga.

A southern fertilizer plant that had been limping along on a 2-phase/3-phase 230-v electrical system has been converted to 3-phase 440 v with good results in operation and output.

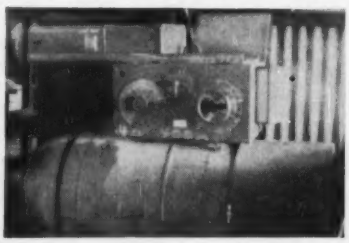
Formerly supplied at 4.16 kv through a Scott-connected substation, the plant was plagued with electrical distribution troubles as well as motor and switchgear failures.

Engineers of Swift & Co's Plant Food Division, ultimate purchasers of the property, and representatives of Savannah Electric & Power Co saw possibilities of improving production through electrical conversion.

The conversion now is complete. A 13 kv/440 v substation has been installed by the power company beside the old 2-phase/3-phase 230-v bank. New underground cables in ducts feed two 440-v incoming switchgear units. These units are completely enclosed in concrete-block rooms in the plant. All conduit in the plant is plastic-covered, and all fittings are taped with plastic to minimize corrosive action of fertilizer dust.

Capacitors on Welders End Power Factor Problem

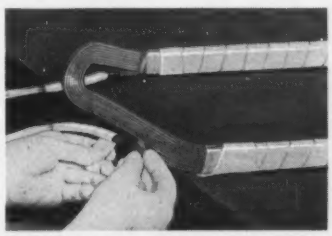
C. D. ANDERSON, Power Sales Engineer, Savannah Electric & Power Co, Savannah, Ga.



Putting 7.5-kvar capacitors atop 25-hp portable welders has solved a low power factor problem for Steel Products Co, a fabricating and trailer manufacturing concern. This company had tried unsuccessfully to raise its power factor to the minimum required by the utility. It first applied capacitors to permanent welding stations, then to the sheet metal production department. However the plant power factor remained below the prescribed minimum. Then the 25-hp welders, scattered throughout the plant, were corrected. Capacitors were connected to the load side of the welders' overcurrent devices and mounted directly on the welders in a horizontal position. These resulting installations are out of the way, require little wiring, and work only when the welder runs.

What happens to coil insulation under these conditions?

● All the laboratory tests, claims and trick names go by the board when a motor goes on the job. It is performance that counts! This is especially so when it's an outdoor installation where fog, hail, snow, rain, dust, sand or chemical fumes give coil insulation the "full treatment". Elliott weather-protected squirrel-cage induction motors have stood this test. *Not one case of stator failure due to insulation trouble* has been heard of since 1948 when Elliott first developed its special coil insulation process. This is the record of 500,000 hp of weather-protected motors installed all over the world serving utilities and industrial plants of all kinds. It is performance that no "laboratory test alone" can prove. It is evidence you can trust when you select a large motor. You don't take a chance on insulation when you *specify* an Elliott Motor. Elliott Company, Ridgway Division, Ridgway, Pa.

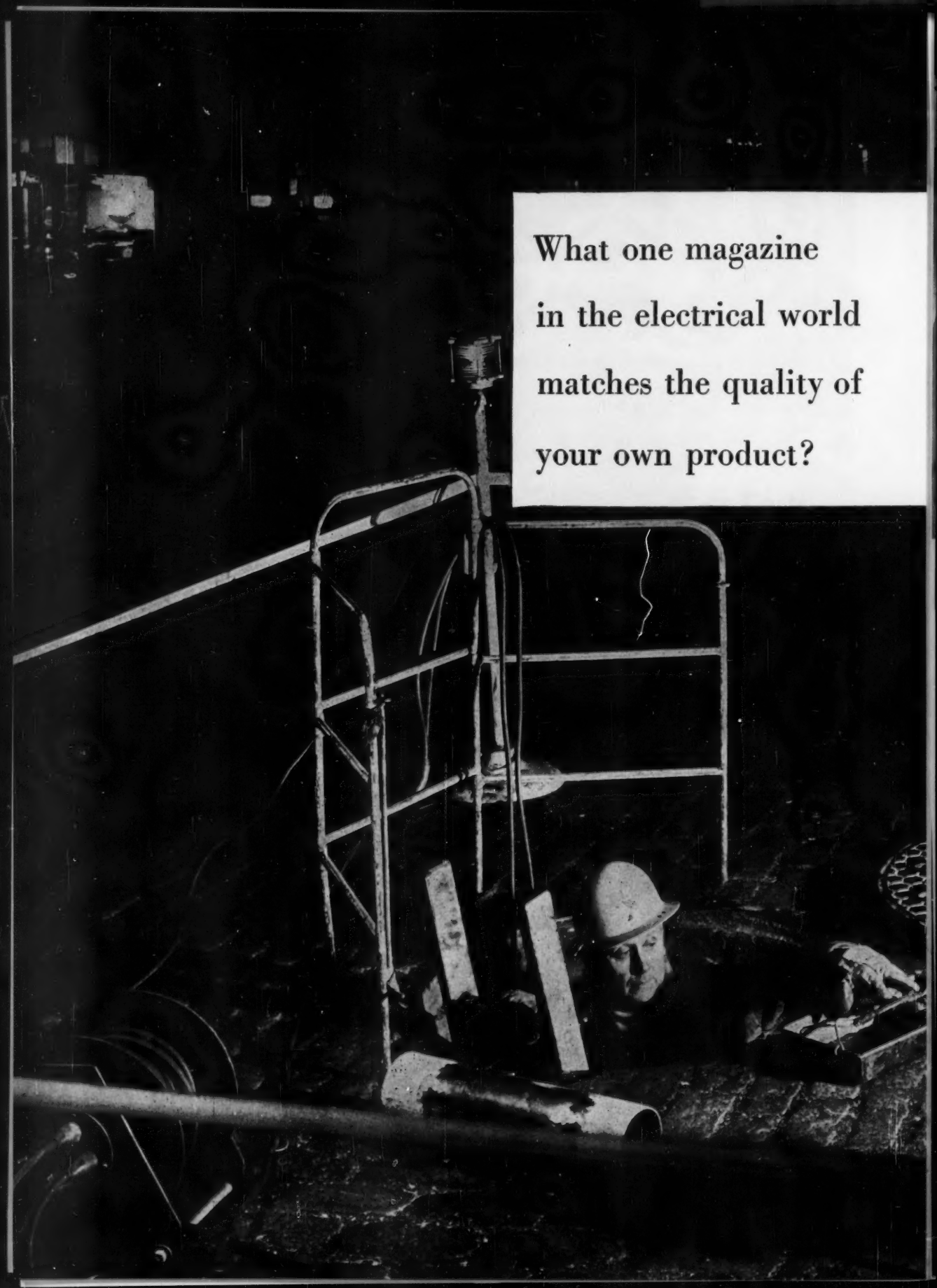


ONE OF THE LITTLE THINGS THAT MAKES A BIG DIFFERENCE IN ELLIOTT COIL INSULATION. A special plastic is inserted where the lead leaves the coil to seal against entry of moisture or contaminants. Fine workmanship plus the most modern materials make Elliott coil insulation tops for large motors.

R6-13

ELLIOTT Company

Elliott large motor insulation is "field-proven"


What one magazine
in the electrical world
matches the quality of
your own product?

You want a sales audience with the busy, burgeoning electric power industry . . . among the world's largest, still shooting up . . . with capital expenditures of nearly $4 billion yearly* . . . filling daily orders from 51 million customers* . . . working around the clock, across the country . . . pressured by the needs of *all* industry . . . hungry for new and better equipment. How do you talk to this hurried, harried, massive market?

Briefly, wouldn't an appointment arranged by a mutual friend of long standing be most effective? Wouldn't it be better to know that you were wanted and expected, than to walk in "cold" off the street? — and doesn't your advertising function in much the same way?

*Electrical World "Industry Forecast"

"The Electrical Industry's Weekly Magazine"

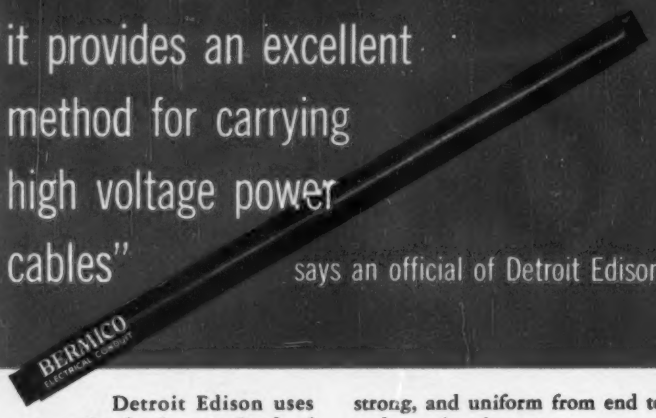
Electrical World

A McGraw-Hill Publication
330 W. 42nd St., New York 36, N. Y.

A Consolidated Edison emergency repair crew splices in a new section of cable beneath 2nd Av. at 23rd St., New York — another example of the round-the-clock effort by electric utilities necessary to maintain your electric service.

BERMICO® electrical conduit is used by Detroit Edison because...

"it provides an excellent method for carrying high voltage power cables" says an official of Detroit Edison



Detroit Edison uses carload after carload of Bermico Conduit to carry high voltage cables supplying continuous power to the automotive center of the world.

Made to precision standards from cellulose impregnated with coal tar pitch, Bermico Conduit is alkali-resistant, acid-resistant, strong, and uniform from end to end—yet low in cost.

Leading electrical contractors and public utilities everywhere are getting the maximum protection and ease of installation that it provides. You can, too, by always specifying Bermico Conduit. Immediate shipment of all sizes and fittings guaranteed.

Distributed by WESTINGHOUSE Electrical Supply Company
Offices in principal cities

BROWN COMPANY
Berlin, New Hampshire
GENERAL SALES OFFICE: 150 CAUSEWAY STREET, BOSTON 14, MASS.

INDUSTRIAL BRIEFS

An electronic drive, powered by nine 40-hp dc motors, permits The Peoria (Illinois) Journal Star to boost its printing press capacity 25%, along with effecting substantial operating efficiencies and providing extensive run-of-press color. The GE-engineered drive system, operated from push-button stations at the press, powers a new Goss Headliner press. Contrasted with a maximum 48-page straight run on the former press, the new one runs 64 pages straight, including four in three colors and black. Maximum on a collect run is 96 pages, eight each in full and in spot color.

On the new press a Goss Reel-Tension-Paster, driven by eight 1½-hp dc motors makes the splice from one paper roll to another without stopping a run. An electronic amplidyne synchronizes the surface speed of a new 40-in.-dia roll with the speed of the web running off the expiring roll. Through an automatic splice, the new roll is immediately put into service. The new equipment cuts overtime on color preparation and operation and produces larger editions in shorter operating time.

TV turned traffic cop recently when Zenith Radio Corp completed installation of a closed-circuit television system for regulating the flow of trucks in and out of the big, main plant in Chicago.

The company's shipping docks are indoors on the second floor and connected to the street level by a two-lane ramp. At the docks, 22 trucks can load or unload at the same time. The almost steady procession of these highway giants up and down the ramp throughout the day occasioned delays and stack-ups. Closed-circuit TV has relieved this.

Now, one man stationed at a single control point can coordinate incoming and outgoing traffic without rising from a chair, and wating time per truck has been reduced. The TV camera is mounted midway up the ramp. About 60 ft away is the monitor in the guard's street-level office. The screen is housed in a master panel along with controls for the electrically-operated ramp doors and second-floor "out" gate. TV enables the guard to sit facing the street and the control panel and "see" through the walls behind him."

Wagner replacement core and coils come ready to install in your old tanks...

fully tested....thoroughly dried....packed in oil!

Obsolete or burned-out transformers needn't be consigned to the scrap heap. With Wagner Form W Core and Coil Replacement Assemblies, these transformers can be made good as new again... *and up-rated at the same time* because the new preformed cores are considerably smaller than the old cores. These packaged replacement core and coil assemblies are factory-new elements, exactly like those used in new Wagner Transformers.

They come to you fully dried and tested—ready for use—protected in a sealed container filled with Wagner 7-NI inhibited transformer oil which you may also use in your tank. They are available in ratings from 3 through 167 kva.

Installation is easy... the assemblies are complete with terminal board or tap changer, with leads ready to install in your tank. Each assembly has a new serial number and name plate.

Wagner Bushing Assemblies

High Voltage Bushing Assembly

Available in cover-mounted or tank wall mounted types to meet a wide range of requirements. Gasket, solderless connector-type terminal and clamping devices are included—fuses can be furnished when specified.

Low Voltage Bushing Assembly

Ready to install—includes porcelain bushing, gasket, solderless connector-type terminal and clamping device.

Field Repair Service for Substation Transformers

Wagner's Transformer Service Trucks—completely equipped for field repairs—each with the services of an expert—are available on schedule in most localities. The cost of this exclusive Wagner service is nominal—write for information.

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

Wagner Electric Corporation
EST. 1891

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

TS56-1

More Factory Cooling Ahead

75% of new Southern plants will be comfort cooled by 1960 says survey; competition, union will spur it in North

Even greater demands for industrial air conditioning—this time for cooling plant workers—are on the horizon if a survey conducted by one manufacturer, The Trane Co, bears itself out.

A definite trend towards air conditioning for employee comfort as well as for climate control of industrial processes is taking shape, says the survey. Trend is particularly noticeable in the South. Some consulting engineers there have estimated that as many as 75% of new factories—and 50% of all factories—will be air conditioned for employee comfort by 1960, and that 90 to 100% will be so equipped by 1970.

But the North also will share in this trend, points out the survey—particularly in factories involving high skills, such as the electronics industry. Primary reasons: 1. Competition in industry for skilled help, 2. desire to maintain employee efficiency in hot weather, 3. pressure from labor unions.

The survey was made by Trane sales representatives who queried architects and consulting engineers in various industrial centers of the country.

The employee-comfort trend is at its greatest in the textile industry. Consultants in this field estimate that 20% of floor space is air conditioned with refrigeration today as against 1% ten years ago. This is exclusive of spaces using evaporative cooling and total floor space includes such areas as warehouses as well as production space.

A report from Greensboro, N. C. says that almost complete air conditioning of textile and tobacco manufacturing areas will be finished by major manufacturers by 1970 and by smaller firms probably by 1980. Very little new construction in either industry will go up by 1960 which is not fully air conditioned, it reported.

Central home air conditioner sales will mount to more than 500,000 by 1960 and more than double to nearly 1,200,000 by 1965, predicts Cloud Wampler, Carrier Corp's chairman of the board. Wampler expects some 200,000 such units to be sold this year.

Dual Voltage . . .

. . . is tried at rural school to limit heating demand during early evening hours

Dual voltage operation of electric heating in a two-room school is being studied by the Taylor County Electric Cooperative of Medford, Wis. Voltage is controlled by a time clock set to change from 240 v to 120 v.

Installed during the past winter, heating demands were 30 kw in December, January, and February. Teacher resets the demand each morning and again after school each day. Heating load is metered separately and the school is billed 1½ ¢ per kwhr.

While the installation has not been in service for a full heating season, the local school board is pleased with results and costs. The teachers like electric heating, too. And, says the cooperative, their opinions are getting an attentive ear from officials of other new rural schools going up in the area.

Demands on the lighting service have been six kw. The school's all-electric kitchen, not yet completed, will increase total demand considerably above this figure.

6 in 100 Families Ready To Buy Room Coolers

Six families out of each 100 who do not own room air conditioners have definite intentions of buying, reports a recent study by E. I. Dupont de Nemours & Co. What's more three out of five nonowners questioned said they have wished for air conditioning at one time or another.

Based on personal interviews with 13,441 householders, the study also showed that the air conditioner buyer, unlike buyers of other major appliances, isn't likely to shop around. Three times out of four he buys in the first store where he looks.

Projected nationally, the statistics turned up by the study showed that 1,720,000 families owned 2,064,000 units in late 1955. About half the air conditioner owners live in the South. But it pointed out that 1955 sales soared 107% over 1954 in the Central States and 96% in the East.

Cold Turkey, Cool Motorists

Motorists dining in the air-conditioned Tavern Restaurant, Amarillo, Tex., drive away in pre-cooled automobiles after their meal. Portable air conditioners cool the cars while patrons eat. This is one way, says Southwestern Public Service Co, in which dealers can advertise and get people accustomed to air conditioning. After dining and driving away in cool comfort, the motorist realizes the lack of cooling once he gets home.

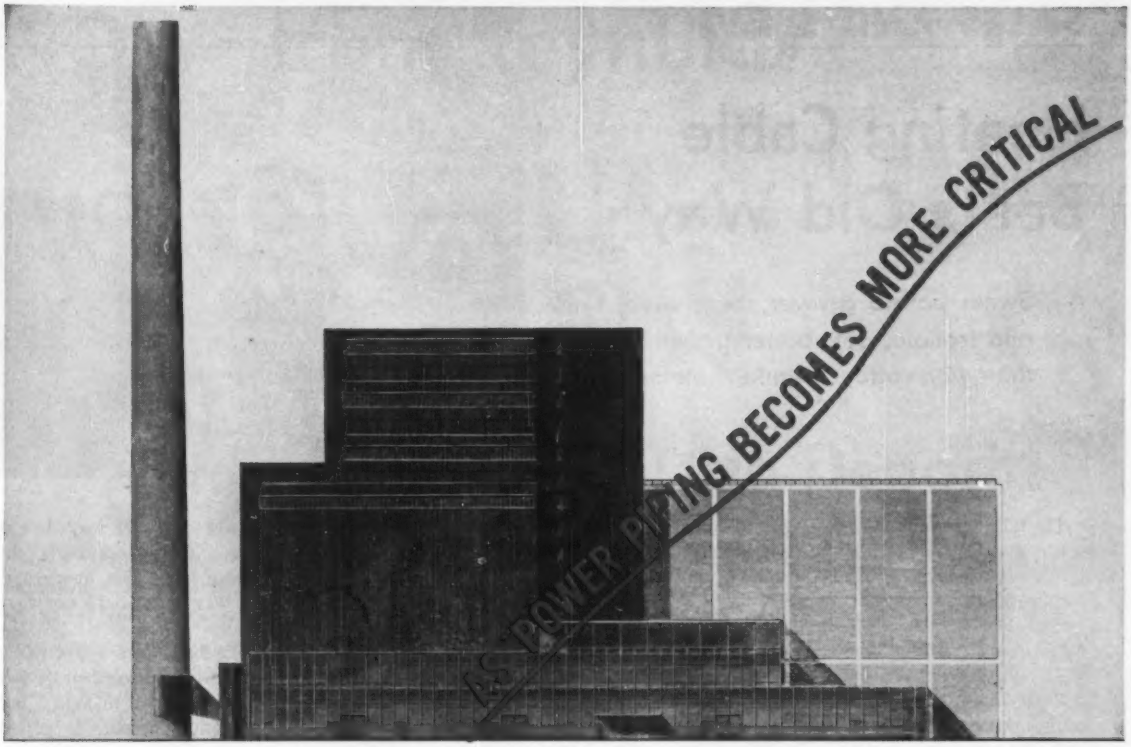
Oil Heating Gaining

The U. S. had 8-million home users of oil heating systems as of January 1, according to Fred E. Weldon, Central Controls Co. This compares with six million in 1950, he said, and three million 10 years ago.

"In our expanding economy, we (the industry) expect to add between 700,000 and 800,000 new domestic users each year for the next five years," Weldon told the 34th Annual Oil Heat Institute convention in New York.

Sets A. C., Electric Heat Show

An Air Conditioning, Ventilating, and Electric Space Heating Exposition is being set up by Electric Institute of Washington for next Feb. 8-10. To stress residetial equipment, the show will feature manufacturers' displays, industry luncheon on opening day. Institute has budgeted $10,000 to promote the affair.



Architect's sketch of Philadelphia Electric Company's new Eddystone station

Kellogg's High Alloy Fabrication Keeps Pace

Designed to operate at 5000 psi at turbine throttle valve, and 1200 F., Unit No. 1 at Philadelphia Electric Company's new Eddystone station presented critical problems in the selection of an alloy for supercritical pressure piping, and in techniques for fabricating heavy-walled sections of this alloy in the shop and in the field.

More than a year ago, The M. W. Kellogg Company presented a comprehensive program to the Philadelphia Electric Company for selecting a suitable alloy, and since then has been working closely with this public utility and other prime contractors toward completion of the project. Numerous materials were studied, welded, tested, heat treated, and evaluated at Kellogg's Jersey City metallurgical laboratories. After many months of extensive and intensive work, Type 316 Stainless was selected. M. W. Kellogg has already perfected welding techniques, and is now continuing tests on this alloy and several other compositions, including strain aging for 1000 hours and 10,000 hours at 1300 F., to accumulate other data.

While this is the first time that Type 316 will have been used in power plant service for temperatures as high as 1200 F., and pressures as much as 5000 psi, it is by no means Kellogg's first experience with Type 316 or other stainless steels. For example, M. W. Kellogg recently undertook metallurgical studies and research for another large public utility prior to its selection of Type 316 for use at 1100 F. and 2400 psi. Kellogg also has done considerable fabrication of main steam lines and turbine leads, using Type 347.

The M. W. Kellogg Company welcomes the opportunity of discussing future power piping requirements with consulting engineers, engineers of power generating companies, and manufacturers of boilers, turbines, and allied equipment.

FABRICATED PRODUCTS DIVISION
THE M. W. KELLOGG COMPANY, 711 THIRD AVENUE, NEW YORK 17, N. Y.
A SUBSIDIARY OF PULLMAN INCORPORATED
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POWER PIPING—THE VITAL LINK

Heating Cable Beats Old Way

Sweet potato grower saves seed, time and trouble, gets better growth control than with cotton "blanket" method

Heating seedling beds by covering them with cotton waste material—a popular practice with many sweet potato and yam growers—is passe for one progressive California rancher.

Ted Dallas, Sr. of Livingston, uses electric heating cable instead and finds it pays him in three ways:

1. His beds now require 30% less seed.
2. It allows better control over growth of the seedlings during the germination period.
3. He saves time and inconvenience. The cotton waste not only cost $50 per bed, but it had to be hauled great distances from gins, and was cumbersome to handle.

The 200-acre Dallas ranch is one of the largest sweet potato and yam producers in the San Joaquin Valley. Each of its twenty 7½ x 120-ft beds has eight ¼-in. lead-sheath cables. Rated at 240-v with 6.6 w per ft, they are laid parallel at 1-ft intervals at a depth of 12-in.

Connected load for the 20 beds totals 128 kw. Annual consumption runs 98,000 kwhr. On a sq ft basis, this is 5.45 kwhr for a cost of about 6.5¢. Dallas figures cost of the cotton waste at the gin was about 5.5¢ per sq ft of bed covered.

Small seed potatoes planted in the beds are electrically heated to protect against frost and to control their growth for six weeks before they are transplanted in fields. Soil temperatures are checked four or five times daily with thermometers at ground level and below. Cables are energized during the germination period as required by outdoor temperatures.

According to Pacific Gas & Electric Co, which serves the Dallas ranch, three other growers in the valley use 230 kw of soil heating cable in their seedling beds. Their annual consumption is 163,000 kwhr, for an energy cost of 6.1¢ per sq ft of bed.

Dealers' View: Lower Profits, More Headaches

Majority of dealers expect lower profits during the final half of 1956, compared to the same six months of 1955 reports survey made by National Appliance and Radio-TV Dealers Association.

Dealers showed disturbance with home builders' practice of buying appliances directly from the manufacturer or manufacturer-distributor. According to seven out of ten dealers in the survey, all of the appliances which builders buy do not go into the new homes, but are sold into regular retail channels. Most of them did not quarrel with direct selling to large builders who start 25 or more units per year, but they did resent this practice with the small builder. This group which puts up less than 25 units a year represents 96% of all builders and only 45% of all housing units constructed.

Seven out of 10 dealers also felt that their profits for major appliances were not large enough to provide the free labor called for in manufacturer warranty programs. Majority suggested the manufacturer pay the dealer for labor cost during the one year warranty period. About one-fourth of them felt the warranty period should be reduced to 90 days (EW, June 18, p 51).

¾th Homes Have TV

Three out of four U. S. households had one or more television sets in sample survey made last February by the Census Bureau. About 4% of all households had two or more sets. Northeastern states had the highest concentration, while the South had the lowest.

Stamp Plan Builds Load For Rural Cooperative

Stamp plans have invaded the electric utility field. Caddo Electric Cooperative of Binger, Okla., has started one as a load building measure and customer acceptance so far, it says, has been good.

Under the plan, the coop issues two stamps for each dollar of annual revenues (about $500,000 at present). Members get stamps when they pay their service bills and when they purchase appliances from participating dealers. Members save their stamps in a book and redeem them for electric appliances available from approved dealers. Stamps are normally credited at the rate of 40 per $1. The plan was inaugurated last February.

For flexibility, number of stamps required can be reduced on occasion to promote desired appliances.

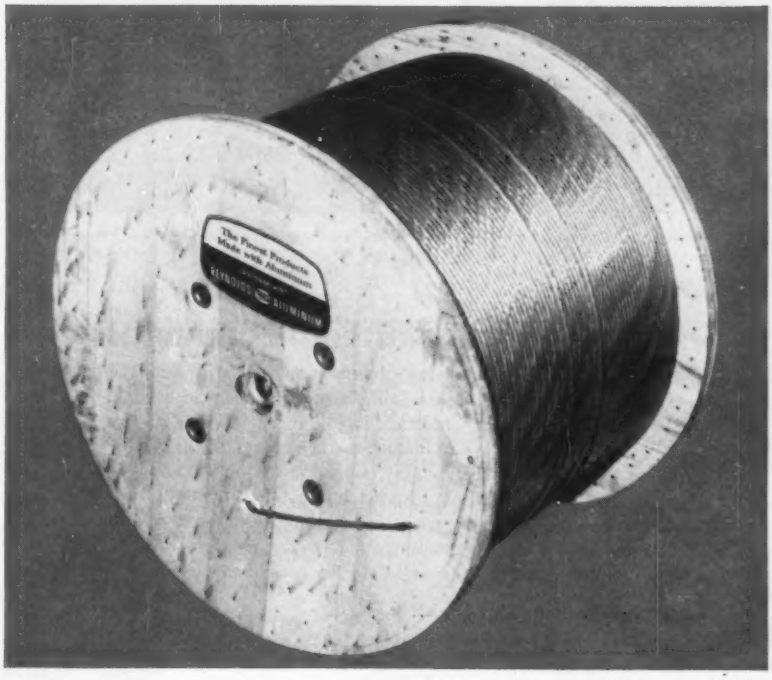
NOW—from Reynolds

NON-RETURNABLE REELS

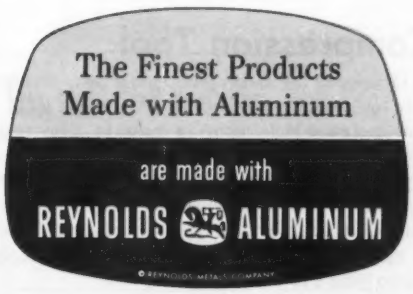
No Extra Charge! No Deposit!

For the first time you can order bare conductors up through 4/0 ACSR on *specially-designed, no-charge, non-returnable* wooden reels. They're lighter —easier to handle than standard returnable reels, but they hold the same amount of cable.

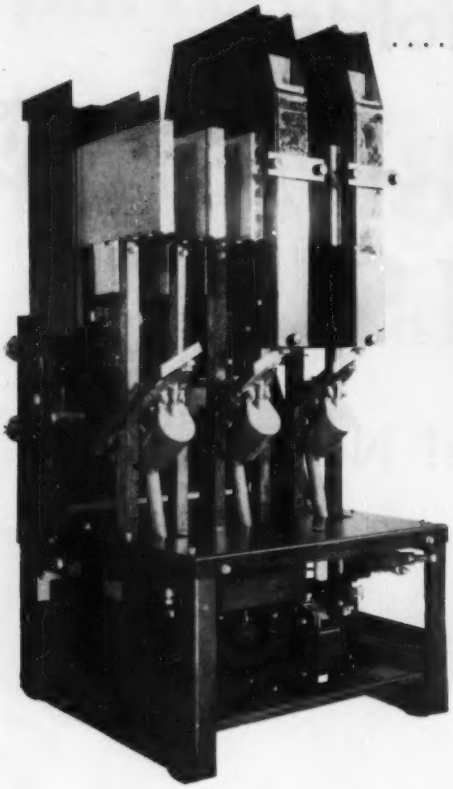
These no-deposit, non-returnable reels from Reynolds are not "junkers"—they're designed and tested to withstand shipping to you in any part of the country, rough handling and stringing operations—on a one-trip basis. And when you've used the cable you simply dispose of the reel. All the way around . . . they save you time and money. *Reynolds Metals Company, P. O. Box 1800-EL, Louisville 1, Kentucky.*



Here's Why They Save You Time and Money



- No reel deposit
- No empty reel gathering
- No reel storage
- No reel inventory
- No reel return shipments
- No reel damage repairs



13.8-Kv Air Circuit Breaker

A metal-clad switchgear unit has a 13.8-kv magnetic air circuit breaker of 750-mva interrupting capacity. Designated 150-DH-750, it is designed primarily for use in protecting distribution circuits in large substations in metropolitan areas.

The unit has the same height and width, and is 6 in. deeper, than manufacturer's next lower rating of its type. It reportedly has 50% greater interrupting capacity.

A horizontal drawout feature is said to simplify replacement or maintenance. For arc interruption, the firm's De-ion principle is used.

Other features claimed include ceramic arc chutes which have high dielectric and low moisture-absorption properties, and high resistance to heat shock.

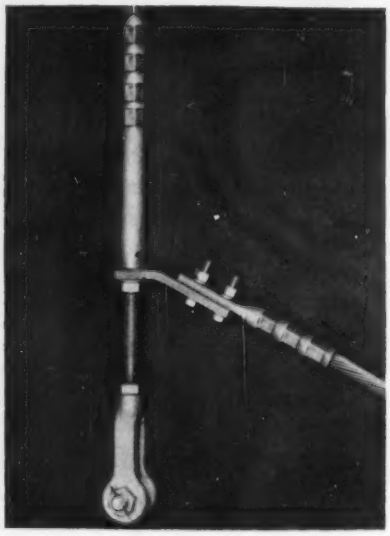
Westinghouse Electric Corp, Box 2099, Pittsburgh, Pa.

Dead End Connectors

Compression dead ends for all commercial sizes of ACSR and all-aluminum conductor are said to have built-in adjustability. This permits adjusting conductor sag to specification after strain connection is completed, manufacturer reports. Line includes three types for both conductors; single and double bolting pads and integral compression loop connection.

Dead ends are also designed for uniform sag on bundled cable. It provides 4 in. of adjustment, varying with conductor size and line construction.

Thomas & Betts Co, Elizabeth, N. J.



Compression Tool

Developed for maker's octagonal compression connector, this tool weighs 2¼ lb and is 11⅝-in. long. It features jaw design which forms a boss in compression center, providing wide contact area. This and friction-free rollers reportedly permit quick operation with one hand.

Compression cycle must be completed before tool releases. After the cycle, plastic covered handles remain in closed position. Tool is called No. 12 Roller Ratchet.

Fargo Mfg Co, Poughkeepsie, N. Y.

KNEE-DEEP IN SALT WATER, workmen guide neoprene-jacketed cables through wire basket for manhole hookup. Neoprene jackets are used because LILCO found metallic-sheath cables corroded under such exposure conditions.

Long Island Lighting Co. reports:

"345 miles of durable NEOPRENE-jacketed primary cable installed underground since 1952"

FLEXIBLE NEOPRENE-JACKETED CABLE enters transformer vault. Neoprene's resistance to abrasion, oil, sewage and salt water assures lasting protection for cable.

One of the country's most rapidly growing sections is Long Island, New York. To keep pace with this expansion, the Long Island Lighting Co. is installing a vast new network of neoprene-jacketed cables, both underground and overhead.

LILCO specifies neoprene jacketing for all underground secondaries, from house service cable to the secondary leads from a 1,000 KVA transformer. All lead sheath primary cables installed since 1952 have a neoprene jacket over the lead sheath.

LILCO estimates 1,000 miles of neoprene-jacketed secondary and street-lighting cable is currently underground.

Much of LILCO's confidence in neoprene stems from their 10-year service records for neoprene-jacketed secondary cables installed since 1946. Despite exposure to corrosive fluids, these cables are expected to give 30 years' or more service—with little or no maintenance required.

Why not get all the facts about durable neoprene-jacketed cable from your supplier? It's available in voltage ratings to meet your requirements.

NEOPRENE

The rubber made by Du Pont since 1932

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

FREE! THE NEOPRENE NOTEBOOK. Every issue contains interesting stories about products made with neoprene. Actual case histories give you the facts about neoprene's longer service life. Clip coupon to get on the mailing list. E. I. du Pont de Nemours & Co. (Inc.), Elastomers Division EW-9, Wilmington 98, Delaware.

*Name*_____ *Position*_____

*Firm*_____

*Address*_____

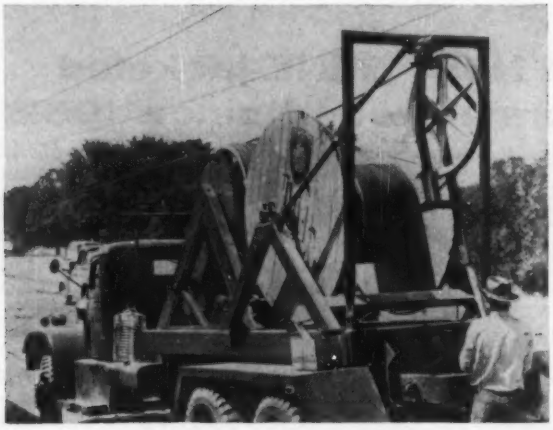
*City*_____ *State*_____

Electrically Powered Lift

Electrically powered by a generator independent of truck's electrical system, this lift has maneuvering reach up to 35 ft. The basket, on the end of a telescopic boom, can reportedly be positioned alongside the vehicle's driver so that it can be entered from the cab. Positioning is by means of a directional single unit control.

Complete stability is claimed without spring locks or outriggers. The design provides safety and efficiency for street light maintenance and other overhead service operations, according to the manufacturer.

Telsta Corp, 2900 Spring St, Redwood City, Calif.



Cable Puller

Designated Model 6500, a cable puller is designed to pull a steel pulling line or old conductor, when used as pulling line, at up to 6,000-lb tension and up to 4-mph speeds. In addition to pulling in over double, neoprene-lined bull wheels, manufacturer says, it simultaneously winds pulling line onto reel. One operator and one reel tender can man the machine.

The cable puller reportedly pulls in over energized circuits up to 12,000 v with safety.

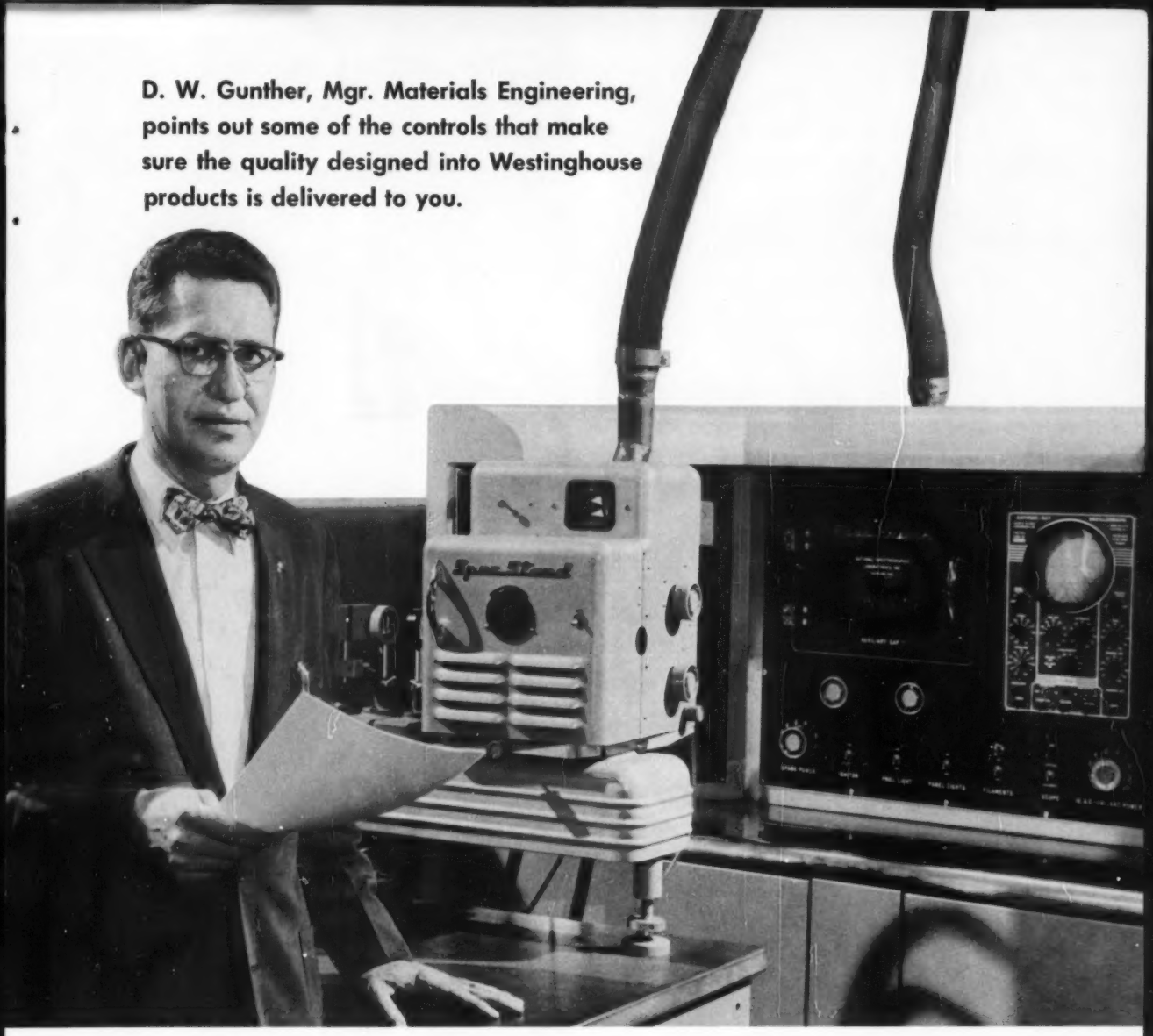
Petersen Engineering Co, Inc, Santa Clara, Calif.

Cable Reel Trailers

Two trailers feature one-man loading gear which picks up reels with arms and, by aid of winch, places them on rail racks. Reels are securely held and revolvable.

Two-wheeler has 6,000-lb capacity and holds three reels up to 36 in. width and 48 in. diam. Tandem-wheel, two-axle job handles 58-in. and 74-in. diam reels up to 10,000 lb. Electric, air and hydraulic braking is available. Clevis hitch permits use behind Jeep or trucks of 1½ tons and up.

Utility Equipment, Inc, 13 Eureka St, Buffalo, N. Y.



D. W. Gunther, Mgr. Materials Engineering, points out some of the controls that make sure the quality designed into Westinghouse products is delivered to you.

How Westinghouse takes trouble out of your workaday world

Trouble-free equipment is no accident. At Westinghouse, the quality that keeps your equipment out of trouble starts on the designer's board, is assured . . . often enhanced . . . by material selection, and it is safeguarded by precise control of production.

Take one. Any Westinghouse product. You can't miss. From production order to shipping platform, this is *your apparatus* . . . its quality, *our responsibility.*

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

We're proud of the men who stake their reputations on these motors.

147 OK's, 26 double-check signatures say "it's right"!

That makes the Westinghouse powerhouse motor — available in ratings to 5,000 hp — the nearest approach to "won't fail, won't let you down" in the industry.

Indoors or outdoors, it is designed to do its job — withstanding dirt, heat, moisture, or loads beyond normal service requirements. Its materials are specially selected, many specifically developed, to meet unusually severe performance standards.

But our real point of pride is the conscientious check - on - check manufacturing procedure that culminates in 26 special in-process inspections, signed by responsible department supervisors. Your motor is right, step by step. Twenty-six personal reputations and careers are bet on it.

Supervisor of inspection signs the release — here an 800-horsepower, 10-pole induction motor is checked over to make sure Micarta® slot wedges and stator windings are perfect. Following this inspection, windings are tested for grounding.

High-frequency test — inspector tests for turn-to-turn faults as the rotor arm slowly revolves, inducing voltage into the windings. This check reveals any short-circuited windings, assures that coils are correctly connected.

Vibration test — balancing equipment checks rotor shaft, frame and bearing brackets for vibration, determines amount and location of imbalance.

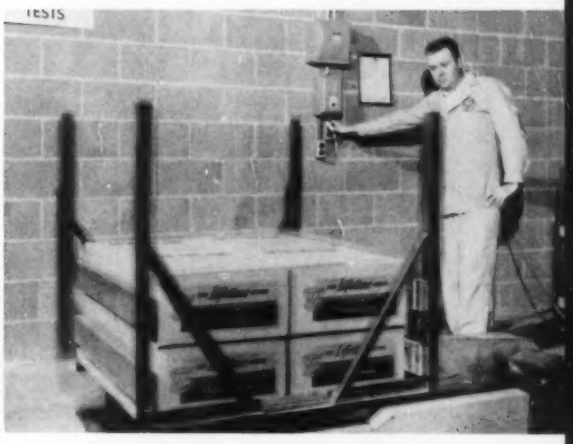
WATCH WESTINGHOUSE

The new meter plant, specifically designed for meticulous manufacture.

A million out of a million are right!

100% inspection is key to uniform meter quality

You get uniformly accurate and dependable meters from Westinghouse for the simple reason that substandard units are not finished or shipped. The "go, no-go" test above, at line's end is no mere sampling. It checks *every* meter. The automatic full-load, light-load and power-factor test must be passed or the meter will not be shipped. Quality production with testing like this is one of the reasons why the Westinghouse meter is the only meter *guaranteed for life.*



Vibration and drop tests are conducted regularly to discover any possible source of damage in shipment. Specially designed packaging for Westinghouse meters has been awarded the seal of the National Safe Transit Committee.

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

Building quality is a way of life with men in transformer and voltage-regulator production.

Quality is a certainty . . . Every regulator is given a complete operation and insulation check prior to shipment. Here the CJ-1 relay settings get a final monitoring.

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

Proved on the production line . . .

Quality that's designed in, stays in

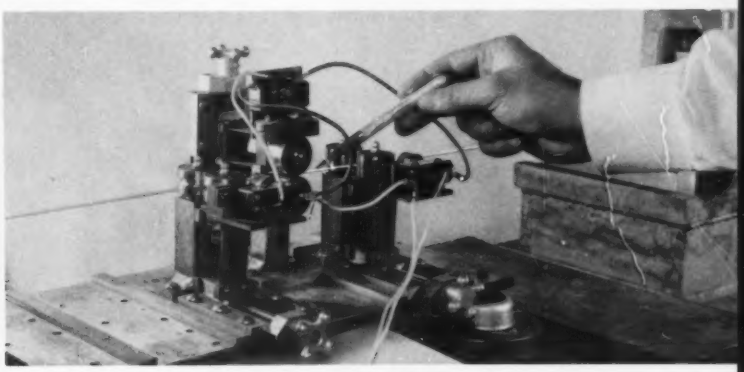
The heart of a program that has actually pitted department against department in plant-wide contests to assure manufacturing quality is this slogan: "Quality must be ***built*** into a product; it cannot be ***inspected*** into it!"

In addition, all Westinghouse foremen spend one week end each year attending a QUALITY SEMINAR where they exchange new ideas and experiences.

Quality control is more than a procedure at Westinghouse. It's an attitude, inspired by team spirit, proved by on-the-line tests. It's your best assurance that Westinghouse equipment will give you the trouble-free performance you want.

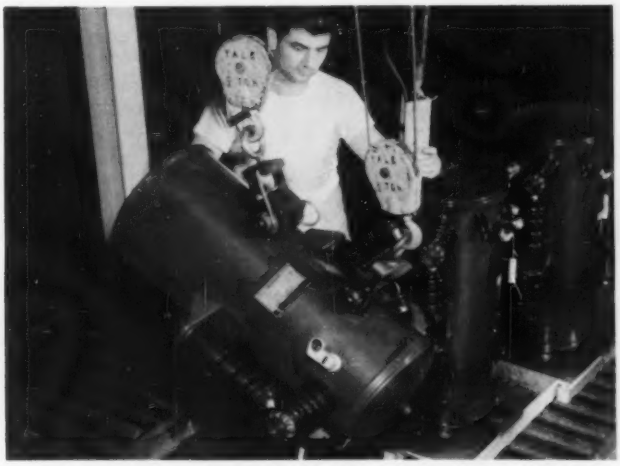
Basic "take it" ability of Westinghouse apparatus, mechanically and electrically, is thoroughly proved on the production line — far beyond service requirements.

Quality is wound in . . . High-frequency test checks turn-to-turn and layer-to-layer insulation both *before* and *after* assembly of transformers and regulators. Preassembly testing is vital, since insulating value of oil might temporarily hide flaws detectable only at this point.



Quality is 3,000 miles long . . . Minute burrs and imperfections on copper wire and strapping can damage insulation. That's why Westinghouse perfected a new system of detection that eliminates any flaw greater than 2 mils. With insulation at a minimum of 20 mils, the protection factor is better than 10 to 1.

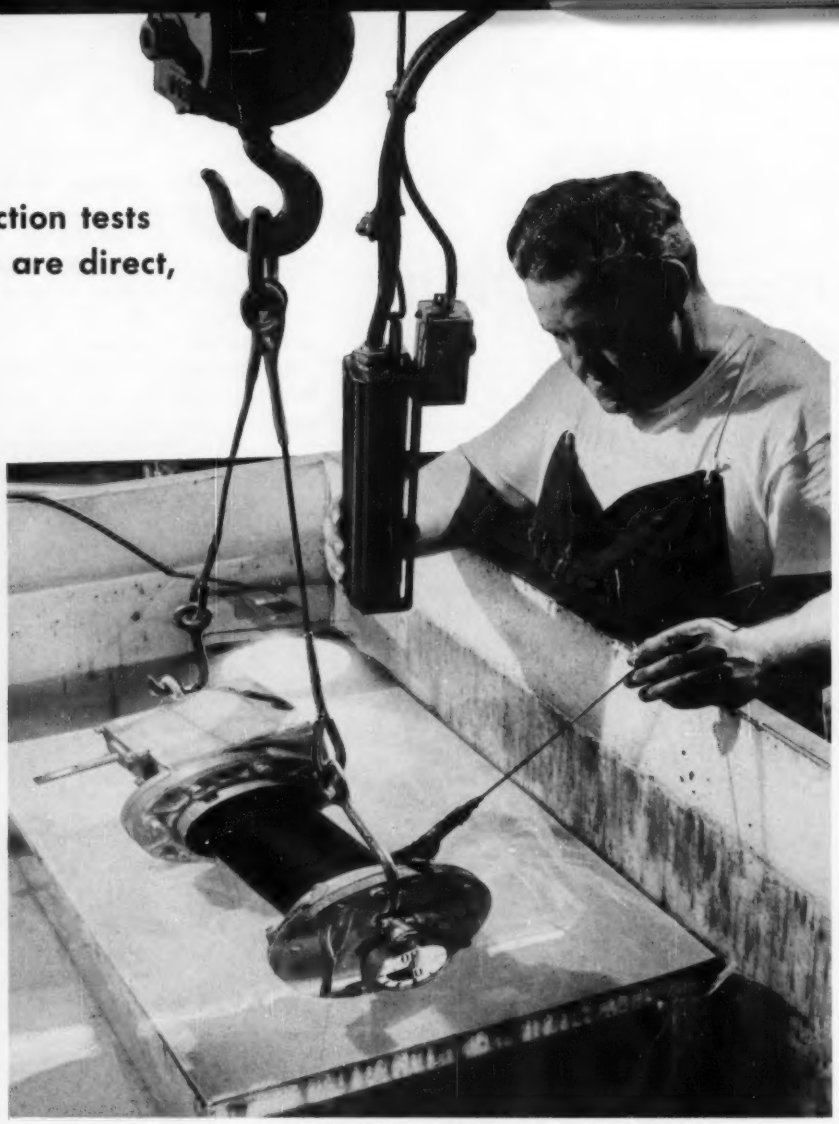
Quality is three skins deep . . . Westinghouse "Coastal Finish," an exclusive three-layer protective skin for transformers, and regulators, forms a granite-hard, weather-resistant surface. Every transformer gets a minimum paint thickness test and a paint adhesion test.



Quality even upside down . . . Tilt test for transformers is the last check on the shipping room floor against oil and air leaks. Pressure tests are also applied before painting, and again after painting when the unit is filled with oil. Every transformer produced receives preproved performance checks like these.

While many production tests are complex, these are direct, simple, effective.

Trial by vacuum — entire interrupter chamber is evacuated to less than one micron with the vacuum manifold above as a final check on soundness of joints and seals; next operation, filling the unit with sulphur hexafluoride.



Trial by water — here the completely assembled interrupter chamber takes the bubble test. In this check, the chamber is filled with dry nitrogen to 30 pounds pressure; leakage, if it exists, is instantly detected.

Here a bubble is a sign of trouble

Westinghouse gas-type interrupters like the VLB switch can't tolerate leaks, or they're short-lived on your lines. Bubbles in water-immersion tests point straight to any potential source of trouble.

All valves and gauges are subjected to 30 pounds pressure with dry nitrogen and "dunked" to prove themselves before they get onto the production line. The operating shaft seal is given the same test and then, after complete assembly, the entire unit is again checked for bubbles.

To assure complete tightness of all joints and seals, the entire interrupter chamber meets a much tougher test. It is evacuated to less than one micron and held there for 20 minutes to check against any pressure rise.

Only then may it be filled with the sulphur hexafluoride which will effectively quench arcs through its long, dependable service life.

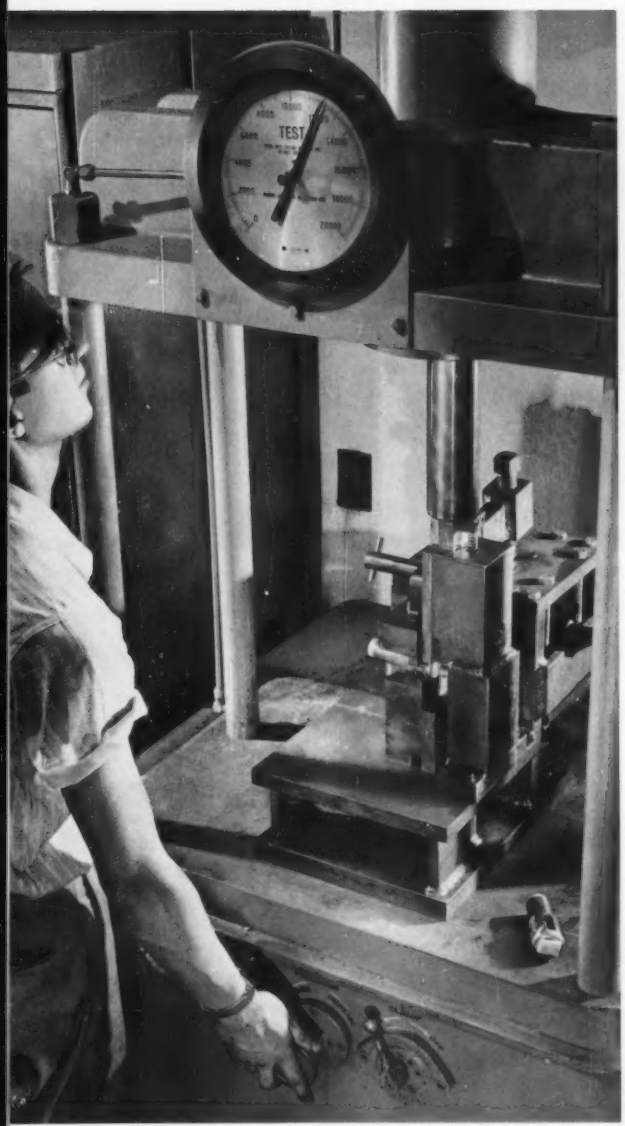
Precision manufacturing techniques, proved by simple tests like this, make the VLB interrupter safe for your system.

WATCH WESTINGHOUSE

Increased breaker ratings add importance to testing of components.

Quality to its finger tips

Power breaker contact tips take 12,000-lb. stress



The brazed joint between silver contact tip and Cupaloy body of every single breaker contact is stressed to 12,000 lbs. This test is made on all curved joints, from both directions.

Transmission of larger and larger blocks of power has sent breaker ratings skyrocketing . . . and the greater the capacity of the breaker, the more important it becomes that every component be checked for utmost dependability. That's why Westinghouse tests breakers, right down to their contact tips.

The business end of the interrupter contact in a Westinghouse De-ion® grid is a silver-tungsten tip brazed to a Cupaloy* body. Before assembly, every piece is 4 times tested for quality and strength of braze. The ability of the breaker to stand up to the mechanical stresses of high power faults and high-speed reclosing is preproved with the severe quality tests shown here. For instance, the Rockwell hardness test: After brazing and heat-treating, every single Cupaloy body is checked for hardness, to make 100% sure breaker contacts will withstand the punishment of short-circuit operation.

These are just a few of the tests Westinghouse breakers go through on their way down the production line. The doubts are hammered out — to give you all the performance that good design intended.

*Trade Mark

In the ultrasonic test, the electronic reflectograph proves that brazed areas are free of even microscopic faults.

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

Materials Engineering not only enhances, it often creates Westinghouse quality.

Ultrasonic test — 34 feet of turbine-generator rotor is thoroughly checked in minutes by high-frequency sound. Cracks, inclusions or other flaws can be detected instantly in this production line, nondestructive test. (Right) Basic materials are also tested to design strength and beyond; they go into production a thoroughly known quantity.

Torture, look and listen

By this the finest material is selected . . . or developed

More than 260 full-time engineers and technicians utilizing a multi-million-dollar laboratory team up with the experienced design staff to give Westinghouse the foundation on which conscientious craftsmanship builds quality.

They set standards for basic materials and establish line checks by which standards are enforced. But more than that, they probe for new materials, new principles for solving design or procurement problems.

Thus, Westinghouse quality rests on a firm tripod: Top design engineering meets service requirements; materials engineering matches design demand; production faithfully meets the standards of both.

This facility of Westinghouse is unequaled in the industry. That's why it's right to say, "You can be *Sure*, if it's Westinghouse."

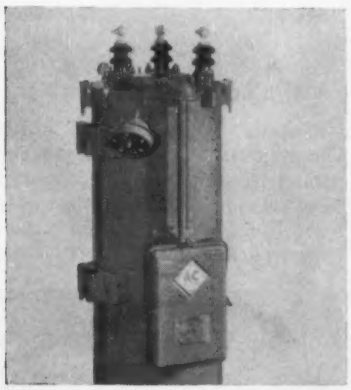
WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU**!*

CP 1036

'Vari-Amp' Adjustment

External "Vari-Amp" adjustment is now available for distribution regulators. It has been used on single-phase power regulators. The adapter can be placed on new units or on those al-



ready in service. Adjustment can reportedly be made with a screwdriver without removing regulator from service.

"Vari-Amp" is said to provide 25 regulating combinations in five current ranges. It increases the load carrying capability to 160% or 400 amp max, depending on size of regulator, manufacturer claims. The adjustment reportedly makes shifting regulators from one substation to another unnecessary when loads increase.

Features claimed for the indicator are reflective numerals, external resettable maximum and minimum drag pointers, maximum and minimum pointers, and color-keyed position numbers.

Allis-Chalmers Mfg Co,
Milwaukee 1, Wis.

Weighing Instruments

Employing electron load cells, a line of weighing instruments is said to simplify data processing and provide remote indication as much as 250 ft from scale platform. Two basic types are offered: Full Electronic in which load cell replaces conventional levers, and Levetronic in which levers are used but with a load cell hooked in tension in steelyard rod. The latter reportedly converts existing mechanical scales to electronic.

The line also includes two weigh batch control systems: one pre-selects batch material and automatically weighs it; the other operates from pre-punched cards.

Fairbanks, Morse & Co, 600 S. Michigan Ave, Chicago, Ill.

Fractional Hp Drives

Incorporating printed circuit boards, a line of adjustable speed drives includes full-wave and half-wave units for dc motor ratings from 1/50 to ¾ hp. Designated Thy-mo-trol, they feature speed control—pre-set from other locations if desired.

Half-way (1/50 to ¾ hp) have plug-in printed circuit boards that reportedly permit assembly and disassembly of basic panel without removal of wires and speed regulation of 3%. Full-wave (¼ to ¾ hp) has rectification circuit designed to minimize torque pulsations. Speed regulation is 5%.

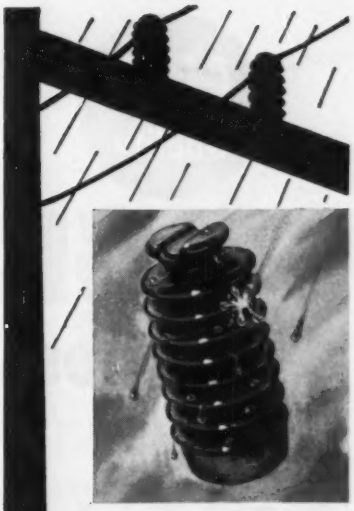
General Electric Co,
Schenectady 5, N. Y.

Cable Reel Jack

This redesigned cable reel jack is made of welded steel sections and is ratchet-operated. It will accommodate up to 2⅜-in. spindles and as a capacity of 10 tons, manufacturer reports. Each pair weighs 130 lb.

Base sections are of 4-in., 5.4-lb channel with side and back legs of ⅜ x 1¾-in. steel. Base measurement of 24 x 14 in. reportedly provides maximum support in both directions. Swivel yoke ranges in height from 27¾ to 45½ in. Square thread has 2-in. diam and is 21 in. long.

T. J. Cope, Inc,
Collegeville, Pa.



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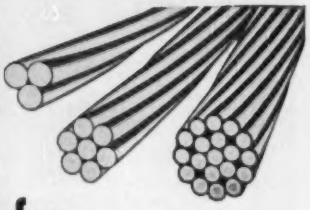

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PAGE Stainless Steel Strand is equally versatile for ground, guy and catenary applications. Its higher tensile strength, corrosion-and-abrasion resistance, elastic limit and strength-to-weight ratio make it your first choice! Its lower cost per year of use means long-range economy.

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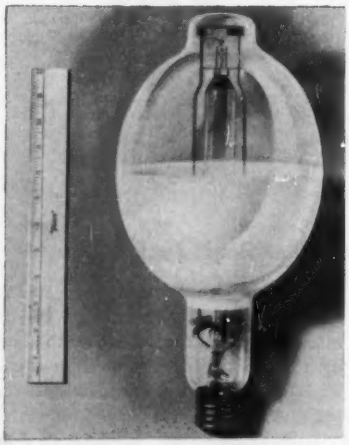
Hot-Line Clamp

A compression-type tap wire contact is a feature claimed for non-ferrous Duragrip hot-line clamp. Available in two sizes for all combinations of copper and aluminum conductors, it is said to fit all standard socket and shotgun-type clampsticks. Employing parallel groove-type tap wire connection, pressure is transmitted through a pad to tap wire.

On aluminum connections clamp, the conductor contacting parts, including the pad, are made of aluminum alloy.

On copper connections clamp, current carrying parts are red brass and high-stress parts are bronze. The bronze clamp is plated for use on all types of conductors.

Bodendieck Tool Co, Taylorville, Ill.



1000-W Mercury Lamp

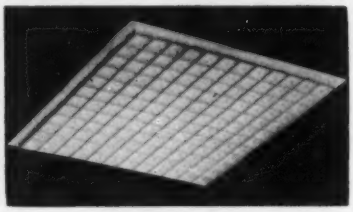
An interior phosphor reflector reportedly directs two-thirds of this 1000-w mercury lamp's light downward. Designated G-E H1000 RC 15, the lamp is 15⅞ in. long, has a mogul base and is rated at 53,000 lumens. It is designed for medium and high mounting in industrial installations. The lamp operates at 265 v.

A companion, H100 RC 12, utilizes same outer bulb with similar light distribution and operates at 135 v.

General Electric Co, Schenectady 5, N. Y.

Plastic Louver-Diffuser

Features of a one-unit plastic louver-diffuser enclosure for lighting fixtures reportedly include control of direct and reflected glare, and easy maintenance. Called CurtiCell, it combines a molded cellular louver bottom



and a flat top diffusing panel into a single electronically-fused unit. Vinyl enclosure is made in 2 x 2 and 2 x 4 ft sizes; weighs 4 oz/sq ft. Cellular portion is available in translucent white or clear plastic with frosted finish.

Curtis Lighting, Inc, 6135 W. 65th St, Chicago 38, Ill.

Telemetering System

A system of telemetering instruments will totalize several flow measurements, correct for such factors as temperature, pressure, specific gravity and supercompressibility in fluids, and provide a corrected flow value, manufacturer claims.

The computing systems are built to fit requirements from manufacturer's standard Metameter transmitters.

Bristol Co, Waterbury 20, Conn.

Load Survey Recorder

A recorder for use in load survey applications (EW, Aug. 20, p 125) will be in production about Nov. 1, manufacturer reports. The recorder unit mounts on conventional meter socket and provides another socket in which

(*Continued on page* 154)

"You'll find this link stick on the LP* list"

O. G. "ANDY" ANDERSON, Veteran Hot Stick Man and Product Merchandise Manager, A. B. CHANCE COMPANY.

LP*...(LINEMEN'S PREFERENCE)...the new, easier way to select Hot Sticks for your maintenance crews

LP* means Linemen's Preference—a term we've applied to the hot line tools used most and *preferred* by most linemen. This list was compiled by combining linemen's selections, determined by a nationwide field survey, with the preferred tools of our own demonstrators who do all kinds of hot stick jobs.

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Here's the manual that supervisors and safety men all over the country have been using so successfully in the training of hot stick crews. It's the most comprehensive, most authoritative guide to safe high voltage line maintenance ever published!

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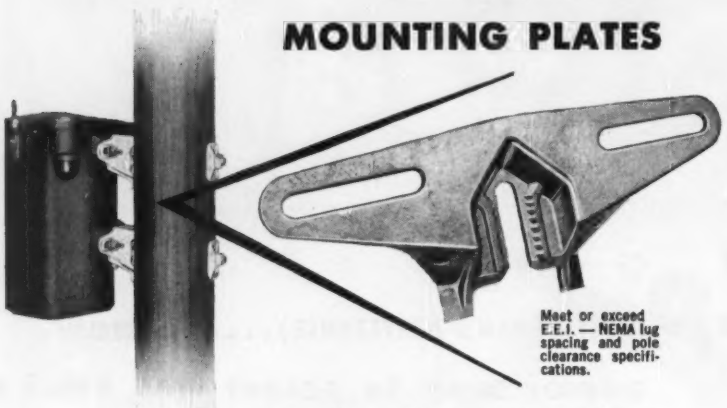

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For further information write for Bulletin PH11-D

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Load Survey Recorder

(*Continued from page* 152)

a standard service meter may be inserted. A separately housed variation of this device provides cables to attach to a 120-240-v, A-base meter.

Recorder includes a separate metering element with contacts to record residential load characteristics on magnetic tape. Up to 32-day survey runs without attention are reportedly obtainable. Additional equipment to complete the survey system includes a translator, also offered by manufacturer, to transfer data from tape to a card punch machine for analysis by machine methods such as IBM. The translator will be sold or offered as a service.

An optional form includes a 15 or 30-amp Type DS meter for measuring consumption for billing during the test period where a meter change is acceptable.

Westinghouse Electric Corp, Box 2278, Pittsburgh 30, Pa.

Correction, Please

An item on a Trolley Bus-Way System made by Electric Service Mfg Co (EW, Aug. 6, p. 138) indicated that the firm makes three different capacity systems. This item should have read "The conductor system has a 300-amp capacity and trolleys are furnished in 100, 200 and 300-amp capacities."

More New Products

Gerber Scientific Instrument Co, 162 State St, Hartford, Conn., offers an electrically-driven **analogue computer** which performs harmonic analysis and curve fitting on plotted or recorded curves.

General Electric Co, Schenectady 5, N. Y., has introduced a permanent-split-capacitor **fan motor** nearly 25% shorter than previous models in 35 mhp to 1/6 hp ratings.

Barber-Colman Co's Wheelco Instruments Div, Rockford, Ill., offers two **non-indicating controllers.** One is potentiometer type (150 Series) for batch process control, the other (151) is an on-off device. Bulletin F-7298-1.

Varflex Corp, Rome, N. Y., offers fiberglass **bonding tape** impregnated with polyester resin said to have wide application range.

Tect, Inc, Dumont, N. J., Cortland Ave & Erie St, has solvent vapor **degreaser,** designated Model 22, with 350-lb metal capacity per hr.

T. J. Cope, Inc, 3rd & Walnut Sts, Collegeville, Pa., has added an adjustable **flat elbow** in standard widths to line of cable trough. It will make angles up to 90°.

Philadelphia Gear Works, G St, below Erie Ave, Phila. 34, Pa., has line of **helical speed reducers** for gear drives featuring mounting flexibility.

Bogue Electric Mfg Co, 52 Iowa Ave, Paterson 3, N. J., offers 5-lb **silicon rectifier** rated at 100 amp, 200 v. It rectifies 20 kw, fits ¼-cu ft space.

Herculite Protective Fabrics, Inc, Belleville, N. J., has **vinyl-coated fabric** for tarpaulins which permits light transmission.

Automatic Switch Co, 391 Lakeside Ave, Orange, N. J., offers safety shutoff, manual reset **solenoid valve** in 1¼ to 3-in. sizes for gas lines.

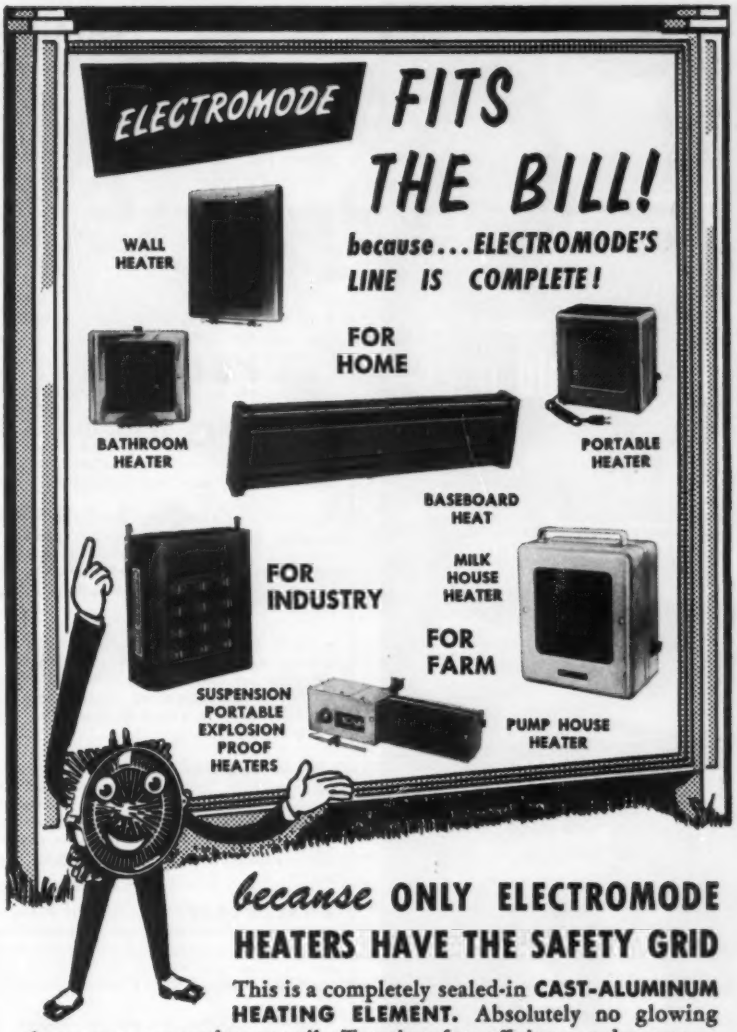
W. L. Maxson Corp's Unimax Switch Div, Ives Road, Wallingford, Conn., offers sealed **snap-acting switch** rated at 20 amp, 125, 250 and 480 v ac; 0.25 amp, 250 v dc and 0.50 amp, 125 v dc. Bulletin 656 available.

Star Expansion, 142 Liberty St, New York 6, N. Y., has one-piece **masonry anchor** called Pin-Grip which seats itself from blows by ordinary hammer.

Felters Co, 210 S. St, Boston 11, Mass., offers non-woven textile **Dynel mat** with high chemical and low electrical resistance.

Arrow-Hart & Hegeman Electric Co, Hartford, Conn., has a 3-wire, polarized flush **power outlet** rated 50 amp, 250 v. Its terminals accomodate Nos. 6, 8 and 10 wire.

Insul-Mastic Corp of America, Dept A-20, 7750 W. 61st Place, Summit, Ill., offers fire-retarding, heavy-bodied **black mastic** that will insulate a metal surface against reaching 1000 F while subject to 2000 F flame.



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CATALOGS—BULLETINS

• **LOAD CYCLE COUNTER:** Applications, features and specifications of load cycle counter with a telemetering feature are described in Bulletin LCC 10, 4 pages. Ram Meter, Inc, 1100 Hilton Road, Ferndale, Detroit 20, Mich.

• **LUMINOUS CEILINGS:** Four-page brochure gives installation details, features and specifications of luminous ceiling. Luminous Ceilings, Inc, 2500 W. North Ave, Chicago 47, Ill.

• **FURNACES:** Data on line of hydryzing furnaces for hardening high carbon and high speed tool steels are included in Bulletin 97-HS, 4 pages. Lindberg Engineering Co, 2450 Hubbard St, Chicago 12, Ill.

• **FLUID DRIVE:** Bulletin 9719, 2 pages, gives data on fluid drive for industrial motors and internal combustion engines. American Blower Corp, Detroit 32, Mich.

• **DUST COLLECTOR:** Bulletin 100, 12 pages, includes drawings, cut-aways, nomigraphs and explanation of multiple tube dust collector's operation and construction. Research-Cottrell, Inc, Bound Brook, N. J.

• **TEST LAB:** Services and facilities for testing, applied research and engineering analyses are described in 72-page bulletin about one test laboratory. Electrical Testing Laboratories, Inc, 2 E. End Ave, New York 21, N. Y.

• **LIGHTING PANELS:** Product and photometric data and calculating tables are included in Bulletins L-110-H on Alba-lite panels; L-110-A on low brightness lens panel; and L-110-C on Crysta-lite panels, 6 pages each. Corning Glass Works, Corning, N. Y.

• **WATER PUMP:** Catalog 101, 8 pages, gives features and specifications of jet-type water pump in ½ and ¾-hp sizes for shallow or deep well use. F. E. Myers & Bro Co, 952 S. Orange St, Ashland, Ohio.

• **CLAMP:** Clamp for pipe or conduit in ¼ through 4-in. sizes is described in 2-page catalog. Fullman Mfg Co, Latrobe, Pa.

• **PHENOLIC COMPOUNDS:** Three brochures describe technical data, features and applications of general purpose (CDC-326), high impact (CDC-325) and one-stage (CDC-324) phenolic molding compound. General Electric Co, Chemical Materials Dept, Pittsfield, Mass.

• **INSULATION:** A 16-page booklet, "What Every User of Electrical Insulation Should Know About Isomica," tells of various types of continuous sheet mica. Mica Insulator Co, Box 1076, Schenectady 1, N. Y.

• **CONTROL:** Applications and features are included in 12-page Bulletin GEA-6334 on packaged control for industry, designated Pan-A-Trol. General Electric Co, Schenectady 5, N. Y.

• **WIRE, STEEL PRODUCTS:** Product catalog, 70 pages, lists wire, steel, conveying and other equipment used by utility, mining, agricultural, chemical and construction industries. Colorado Fuel & Iron Corp, 575 Madison Ave, New York, N. Y.

• **PANELS:** Applications of problem-solving cubicle and panel installations are described in 8-page folder "How to Simplify Your Control Installations." Minneapolis-Honeywell Regulator Co, Industrial Div, Wayne & Windrim Ave, Phila. 44, Pa.

• **COMBUSTION CONTROL:** Safety, efficiency and life of equipment are detailed in "Control Fundamentals—Their Application to Combustion," 16 pages. Cleveland Fuel Eqpt Co, Dept A, 1111 Brookpark Road, Cleveland 9, Ohio.

• **VOLTAGE STABILIZING TRANSFORMER:** Features, data on where to use, operating characteristics and specifications on voltage stabilizing transformer are included in Bulletin GEA-5754C, 16 pages. Application photos, wiring diagrams and performance graphs are also shown. General Electric Co, Schenectady 5, N. Y.

• **WIRE:** Catalog on wire, ribbon, weld and carbostrip products gives features and design characteristics. Sylvania Electric Products, Inc, 12 2nd Ave, Warren, Pa.

• **CORE TESTING:** Bulletin 136, 16 pages, describes use of pulse control systems to test tape-wound or ferrite cores by digital techniques. Burroughs Corp, Electronic Instruments Div, 1209 Vine St, Phila. 7, Pa.

• **STEEL SPECS, APPLICATIONS:** Guide to determining specifications to apply to various carbon, alloy and stainless steel tubing, pipe, seamless welded fittings and flanges is presented in Folder TDC-186, 4 pages. It is cross-referenced between steel, application and specs. Babcock & Wilcox Co, Tubular Products Div, Beaver Falls, Pa.

• **MICROMINIATURE RELAY:** Operating features and specifications of hermetically-sealed microminiature relay are given in Bulletin GEA-6346A, 8 pages. General Electric Co, Schenectady 5, N. Y.

• **DIESEL ENGINES:** Fourteen-page bulletin on Series 251 of diesel engines includes dimension charts and specification tables. Alco Products, Inc, Box 1065, Schenectady, N. Y.

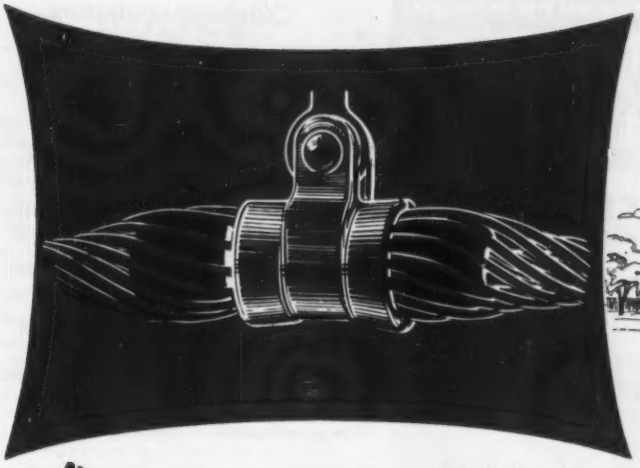
• **COIL WINDER:** Features, capacities (down to 3/32 of in. ID) of Toroid coil winder are listed in 2-page brochure. Electro Devices Co, 580 Main St, Wilmington, Mass.

• **ASSEMBLY KITS:** Brochure TDS 1110, 12 pages, describes components of electro-mechanical assemblies possible on assembly kits. Servo Corp of America, 20-20 Jericho Turnpike, New Hyde Park, L. I., N. Y.

• **GAS PRODUCERS:** Applications, dimensions, ratings and diagrams of Thermalene (endothermic) gas producers are presented in Bulletin GEC-1391, 4 pages. General Electric Co, Schenectady 5, N. Y.

• **SCREWS, BOLTS, NUTS:** Catalog 11B, 12 pages, describes one-piece, self-locking fasteners. Nylock Corp, 475 5th Ave, New York 17, N. Y.

(*More Catalogs on page* 158)



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Yesterday's answers are not good enough. Today's will need improving tomorrow.

Take the problem of vibration fatigue. Failure of strand because of vibration or galloping does not occur in mid span. But it becomes a real problem at points of stress concentration, such as the end of the clamp keeper—at mass concentrations, such as at clamps, dampers and rigid splices—or at wearing points at loose attachments or fastenings.

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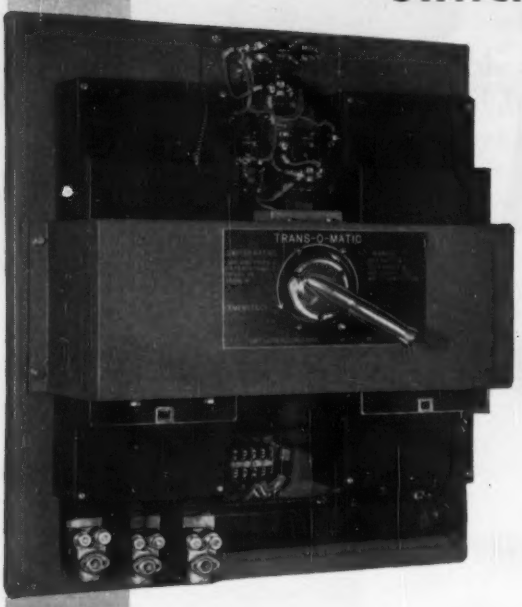

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Catalogs—Bulletins

(*Continued from page* 156)

● **HOOK-UP WIRES:** Details of Permacode extruded Teflon hook-up wires are listed in Bulletin 1901, 2 pages. Revere Corp of America, Wallingford, Conn.

● **PLASTIC PIPE, FITTINGS, VALVES:** Catalog 10050, 8 pages, explains installation, applications and physical properties of rigid Koroseal pipe, fittings and valves. B. F. Goodrich Co, Marietta, Ohio.

● **DEAERATOR:** Operating principles and features of cold water deaerator are given in Publication 4653, 4 pages. Cochrane Corp, 17th St below Allegheny, Phila. 32, Pa.

● **FLOODLIGHT:** Four-page bulletin on Wide-Lite floodlight has features, specifications and listing. Wilson Electrical Eqpt Co, Houston, Tex.

TECHNICAL LITERATURE

FLEXIBLE BRAID CONNECTOR—Electrical and physical properties of flexible copper braid connector are described in 16-page news letter (No. 16). A summary of findings on varied operating conditions testing, it deals with end effect, heat dissipation from surfaces, ventilation, skin, proximity effects and other factors influencing current-carrying capacity of braid connectors for ac and dc. Burndy Engineering Co., Inc., Norwalk, Conn.

EMPLOYMENT—"Criteria for Professional Employment of Engineers," a 23-page booklet published by National Society of Professional Engineers, suggests responsibilities of employer to his professional employees and vice versa. Topics include recruitment, indoctrination, professional development of individual, salaries, titles, personnel practices and termination policies. Single copies are 25¢. Quantity prices range from 20¢ each for 10-49 copies to 10¢ for 100 or more. Write 2029 K St, N. W., Washington, D. C.

COTTON SHEET, TAPE: British Standards Institution has revised B.S. 419 "Varnished Cloth, Sheet and Tape for Electrical Purposes" to include a modified test for electric strength of tapes under mechanical tension, a test for extensibility of bias-cut tape. Price, $1.90. Write 2, Park St, London, W. 1.

CIRCUIT BREAKER TESTS—Association of Short-Circuit Testing Authorities, 36 Kingsway, London, W.C.2, England, has published "Certificates of Rating with Special Reference to Supplementary Proving Tests of Circuit-Breakers." The 8-page booklet describes supplemental tests deemed necessary besides those listed by ASTA British Standards. Price, $1.90.

TRANSFORMER INSULATION — Pending a revision by British Standards, the British Electrical & Allied Manufacturers' Association has published a 22-page booklet "The Insulation Level of Power Transformers." It presents BEAMA's views on selection of insulation level and impulse-voltage tests for power transformers. Price, 95¢. Write 36-38, Kingsway, London, W.C. 2, England.

BOOKS

How Rates Are Set

Electric Utility Rate Economics. By Russell E. Caywood. Published by McGraw-Hill Book Co, Inc, 330 West 42nd St, New York 36, N. Y. 236 pages, illustrated. Price $10.00.

This book makes available a concise, practical, up-to-date guide to the art of electric rate making. It also presents the economics of the electric utility business, including regulatory aspects, as a framework on which rates are built.

Fundamentals of the business are described as a foundation for discussion of such topics as the theoretical basis of price structure and tariff, engineering economics and cost analysis, the rate department, earnings, utility plant, depreciation, and rate of return. Material has been presented in such a way as to point out the many factors involved in rate making and to indicate their relationships, thus giving the reader orientation in and a broad view of the subject. Other objectives have been to suggest methods and approaches, to provide a working tool for use in connection with rate problems, and to stimulate research in the field.

This book will serve as a reference for experienced rate men and provide the beginner with a training tool. It gives the utility lawyer and power salesman the fundamentals of the business and of rates which should help the former in rate cases and assist the latter to explain rate matters more effectively to customers.

High-Frequency Engineering

Transmission-Line Theory. By Ronold W. P. King. Published by McGraw-Hill Book Co, Inc, 330 W. 42nd St, New York 36, N. Y. 520 pages, illustrated. Price $12.00.

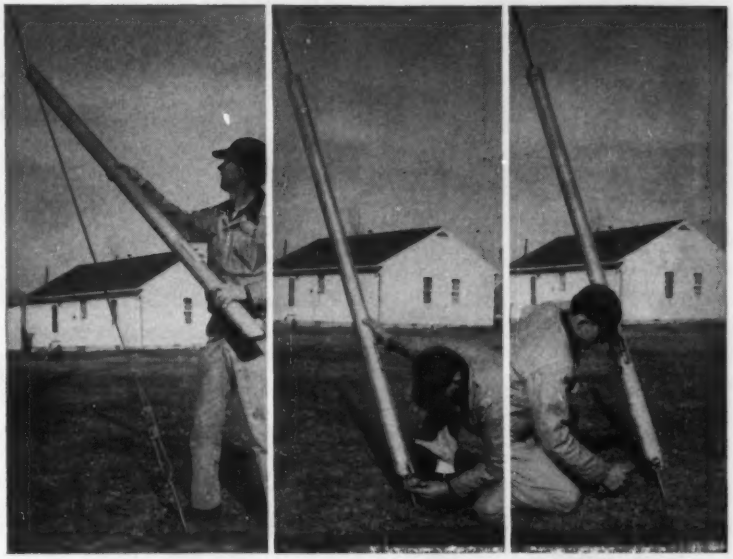
The engineering concept of transmitting high-frequency electromagnetic energy is stressed in this book, rather than the physics. The objective is to prepare engineers to carry on technical and scientific advancement in this field, replacing physicists who have moved into newer activities.

The author uses the lumped-constant concept of transmission lines to establish a bridge with electro-magnet theory. He then expands the coverage to all the basic components of high-frequency generation, measurement, control, and radiation. His approach is predominantly analytical and requires sound knowledge of differential and integral calculus, differential equations, and ac theory.

Major interest in this book will be as a text for graduate students in communication and high-frequency techniques. But utility engineers interested in application of high frequency power or communication would find it helpful as a reference and a text for self study.

Tighten only 1 easy-to-reach bolt to install the CHANCE MONO-BOLT GUY GUARD

When a groundman installs a Chance Mono-Bolt Guy Guard, he has only three things to do:



1 Slip the flanged hook over the guy wire.

2 Place clamp on anchor rod and slide it into the slot at bottom of guard.

3 Tighten this one bolt at the lower end of the guy guard.

It's that easy—your men don't have to be extra tall—there's no stretching for high bolts to tighten . . . the Mono-Bolt clamp securely grips the anchor rod with a firm 3-point gripping action . . . only a single wrench is needed. Easy installation makes for proper installation.

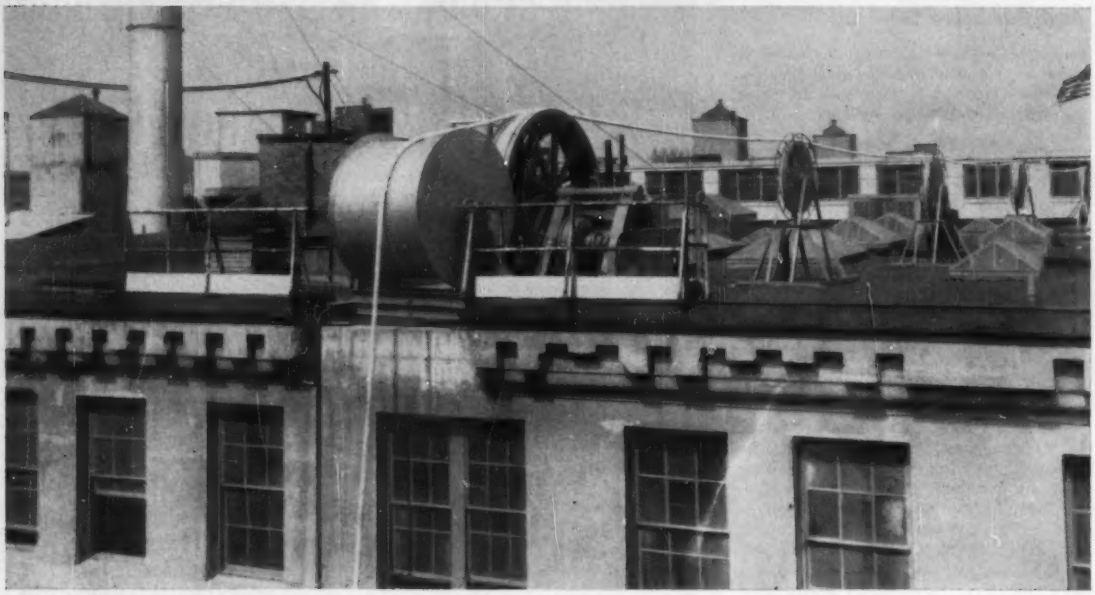
Heavy gauge steel guard is hot galvanized for long life and high visibility.

Mono-Bolt Guy Guard comes in half or full round construction, in 7 and 8 foot lengths. Fits any size rod from ½" to 1¼".

CG56-9

A·B·CHANCE CO·

CENTRALIA, MISSOURI • San Francisco, Cal. • Pittsburgh, Penn.



Simplex Simplifies Hefty Reel Windings

At Simplex Wire & Cable Co's Cambridge, Mass., plant, an over-the-rooftop method provides quick, efficient winding of 50-ton reels of cable.

Earlier this year Simplex devised a set-up to haul cable up from the cable shop's armoring machine to the roof. Guides support the cable across the 160-ft run to a capstan and idler, then down to the wind-up reel.

Both capstan and wind-up reel are driven through fluid clutches whose slip action adjusts speeds to that of the armoring machine. The wind-up gear is designed to handle up to 10-ft diam reels with 13-ft traverse.

The firm's second and largest job came last month when the 156-in. long and 120-in. diam reel seen at left was wound with 27,000 ft of cable weighing 37 tons.

The reel sets on a platform so it can be rolled onto a trailer. A pair of lifting-type reel stands are shipped with reels.

Skyworker Corp Formed, Acquired by Emhart Mfg

Tey Mfg Co and Maxwell Equipment Co, producer and marketer of Skyworker truck equipment, were merged recently, forming the Skyworker Corp of Milford, Conn. The latter corporation was then acquired by Emhart Mfg Co of Hartford, Conn., as a wholly owned subsidiary.

Emhart reportedly issued 17,500 shares of its stock in exchange for all outstanding Skyworker shares.

Skyworker's officers are: Chairman of the board—Sixten F. Wollmar, who is pres of Emhart; president—F. R. O'Leary, exec. v.p. of Emhart; vice president—G. T. Coovert, gen. mgr. of Emhart's Henry & Wright and V&O Press Co divisions; and secretary and treasurer—R. J. Decker, Emhart treas. Sales manager is O. B. Maxwell.

Other Emhart subsidiaries are Maxim Silencer Co; Hartford-Empire Co, maker of glass container manufacturing equipment; and Standard-Knapp, automatic packaging machinery producer.

U. S. Copper Production

Refined copper stocks hit 87,944 tons at July's end, a 1956 high. This is 27,770 tons over June, according to Copper Institute, New York. July primary production was 84,970 tons, a 13,526-ton drop from June. Refined output was 125,400 tons in July, down 11,300 tons from June totals. Fabricator deliveries slumped to a 1956 low of 97,698 tons. This is 45,350 tons under April, 1956 high point.

(*More M & M on page* 162)

Standard®

Transformer's DESIGN FEATURES HELP CUT COSTS

● Standard Transformer's attention to transformer components helps cut maintenance costs and boosts transformer life, yet you pay no more for Standard equipment.

Insulation exceeds all ASA specifications and gives increased protection against flashover. Coils are moisture-proof.

Power-sheared laminations minimize short circuits and core loss caused by burrs. Simple construction eliminates expensive and unnecessary clamps and parts in core assemblies. Greater coil surfaces practically double radiated heat.

NEMA size connectors, strain tested by mercurous nitrate, are used on all bushings. Installation and maintenance time and costs are reduced.

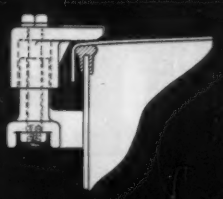
Standard engineers will incorporate components of your choosing in your transformers and work with you to design the transformers best suited to your needs.

WRITE for your new Standard Single-Phase Transformer Bulletin S-401-B. It's ready now!

Standard®

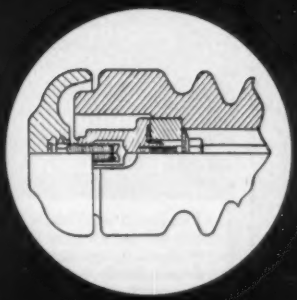
THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO
REPRESENTATIVES IN PRINCIPAL CITIES



UNIFORM SEAL—This Standard design feature creates a four-point contact that assures a positive seal completely around the transformer cover. A Neoprene gasket seals out all dust and moisture.

TAP CHANGER—Your transformers can be equipped with four taps above or below, or half above and half below, as you specify. The switch embodies a contact-making assembly with a spring-loaded brass wheel for positive contact. Normal settings are with a four-tap voltage section. 2½% taps within 10% range of normal rating.



TANK WALL BUSHING—Permits line insertion without tools. No exposed live parts. Terminal compression stud keeps insulated plastic cap from falling off when unscrewed to receive primary leads. Cables enter from either side. Pressure from clamping shoe holds lead securely.

STEEL

Every Kind

Quick Delivery

Plates, Structurals, Bars, Sheets, Tubes, etc. Carbon, Alloy, Stainless Steels, Babbitt Metal.

RYERSON

Plants at: New York • Philadelphia Boston • Wallingford, Conn. • Charlotte, N. C. • Cincinnati • Cleveland Detroit • Pittsburgh • Buffalo • Chicago Milwaukee • St. Louis • Los Angeles San Francisco • Spokane • Seattle

SHAW-PERKINS COOLING RADIATORS

. . . properly designed to cool power and distribution transformers

Designed and built by the pioneers and specialists in economical, dependable self-cooling methods. Sizes and models for any make transformer. Valves, flanges, elbows available. Transformer tanks built to customer's design.

Write for full information. SP-11

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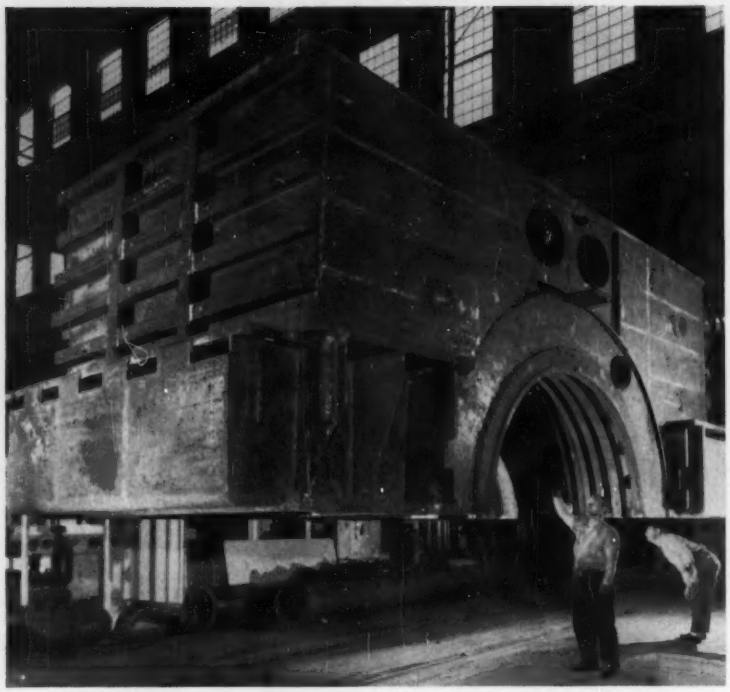


Big Weldment Readied for Detroit Ed

Allis-Chalmers Manufacturing Co workmen signal "slow and easy" for hoisting this 98-ton weldment. The base section for Detroit Edison Co's 300,000-kw steam turbine-generator unit, it is the heaviest weldment ever produced by the Milwaukee, Wis., firm for steam turbines.

Slated for use in Detroit Ed's River Rouge plant, the weldment measures 12 x 15 x 30 ft. The entire turbine-generator, which A-C is now constructing, will weigh 1,615 tons.

Manufacturers Report Plant Expansions

• Thirty-three percent more space for production of high-voltage cable devices will be gained for G & W Electric Specialty Co when a new factory and office is completed in November. The structures are under construction at Blue Island, Ill., a suburb southwest of Chicago.

• Assembly operations for motor and drive production are housed in a recently dedicated $500,000 plant of Reliance Electric & Engineering Co. This Burlingame, Calif., facility will serve as West Coast headquarters in addition to activities of the firm's newly acquired Reeves Pulley Division.

• Fundamental and applied research and advanced lighting engineering will be undertaken at the Advanced Lamp Development Laboratory of General Electric Co. Ground was broken for the $5-million Nela Park addition in Cleveland, Ohio, this summer.

Also, a 135,000-sq ft plant for manufacturing fractional horsepower motors has been announced by General Electric Co. Products of the Murfreesboro, Tenn., facility will be used in home laundry and electric sink appliances.

• Added facilities for production of fluorescent lamps is planned by Sylvania Electric Products, Inc, for its Danvers, Mass., plant. The 118-000-sq ft addition will be completed in the summer of 1957.

• A new induction vacuum melting department will switch to regular production after completion of research studies on high temperature alloys, according to Allegheny Ludlum Steel Corp. Tests on wheel and bucket

alloys for gas turbines and high temperature steels with other applications are expected to pave the way for added production know-how.

• Expanded manufacturing of industrial control equipment and control centers, and facilities for larger repair work are planned for a Westinghouse Electric Corp plant in Cleveland, Ohio. To be completed in June 1957, the addition will include 63,000 sq ft of plant and office area.

• Silicon business expansion is the likely purpose of Du Pont Co's recent purchase of 10,500-acre Brevard, N. C., tract. The land will be the site of a plant employing about 200.

• Increased production of electrical distribution and control equipment is planned for a $3-million, 150,000-sq ft plant to be built in Lexington, Ky., by Square D Co. The Detroit manufacturer is spending $6 million more for other expansions in Atlanta, Denver and Milwaukee.

• Expanded line of portable and stationary air compressors and tools has occasioned ground-breaking for Schramm, Inc, plant addition in West Chester, Pa. The building will increase factory floor space from 145,000 to 181,000 sq ft.

• Carrier and microwave equipment facilities will be augmented by a building, which will incorporate and enclose an existing structure, for Lenkurt Electric Co in San Carlos, Calif. It will house manufacturing, engineering and administrative departments.

• A 60% increase in floor area will boost electrical and electronic insulation production for Bentley, Harris Mfg Co upon completion of a Conshohocken, Pa., addition this fall.

U. S. Aluminum Production

Primary aluminum output in the U.S. during July was a record-breaking 151,624 tons, up nearly 6,000 tons over June, according to the Aluminum Association, New York. (Effects of the United Steelworkers nine-day strike at Aluminum Co of America's plants and the walkout which curtailed Reynolds Metals Co production will be reflected in next month's totals.) Total production for the first seven months of 1956 reached 1,011,928 tons compared with 892,535 tons for the same period last year.

(*More M & M on page* 164)

"seven league boots"...

for
JERSEY CENTRAL
POWER & LIGHT CO.
through the SUPERVISORY CONTROL SYSTEM
installed by
CONTROL CORPORATION

When storms struck the recreation area served by Jersey Central Power and Light Company it often became a two hour job to reach the remote substation to manually operate the 34.5 KV feeder line circuit breakers.

Now Supervisory Control does the job in seconds . . . with newly installed Control Corporation Supervisory Control System and a single leased wire. One man has an instantaneous and complete visual picture of every circuit breaker at all 10 substations . . . a total of 50 circuit breakers in all. By a flip of the switch the operator can check or operate any circuit breaker over the 45 mile feeder line. Service is restored in seconds instead of hours.

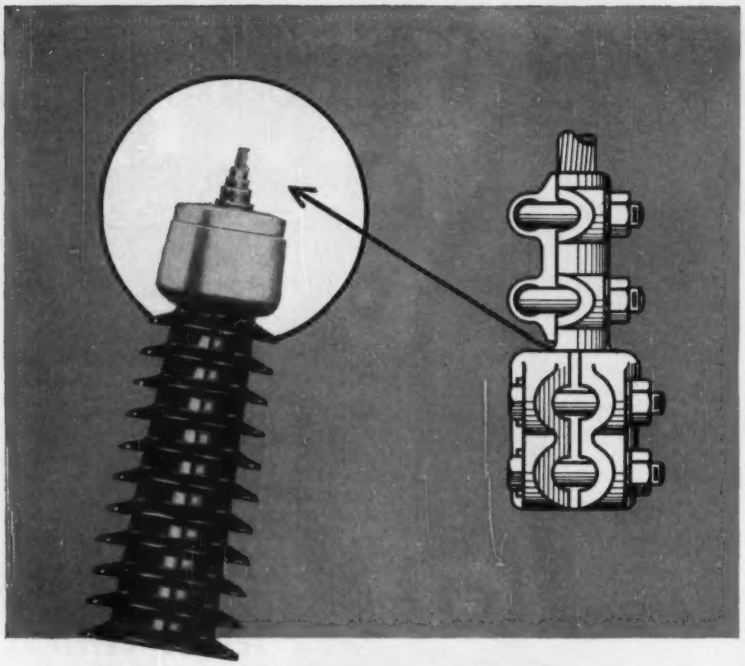
Control Corporation equipment is not new to Jersey Central Power and Light Company. This new installation compliments their complete Supervisory Control and Telemetering System used to control their six large substations from Allenhurst, New Jersey.

Control Corporation has been specializing in supervisory control and telemetering for twenty years. Put these many years of specialized experience to work for you. Our experienced engineers will be glad to make engineering recommendations and give you price estimates. Write to CONTROL CORPORATION, 723 N.E. Central, Minneapolis 14, Minnesota.

Automatic and Supervisory Control
Automatic Synchronizing Equipment
Battery Chargers
Carrier Current Equipment
Frequency Control Equipment
Load Control Relays
Voltage Regulator Battery Chargers
Telemetering Systems
Switchboards
Transformers (small)
Water Heater Control

EXPERIENCED FIELD ENGINEERS IN PRINCIPAL CITIES

Control Corporation
The nameplate of Quality
MINNEAPOLIS
• Super-Trol • Peak-Trol • Telemetering • Battery Chargers • Carrier Current



Will missing stud connectors wreck your schedule?

Too often they're forgotten until a lineman discovers them missing—*on the job*. That can mean days of delay, money lost, and the timing you planned ruined.

Vital links we call them at Royal—like the spark plugs on your car. You want the *finest*, and you want them *on time* . . . with Royal you've got both. Royal stud connectors are high strength copper alloy, designed so that the temperature rise is always less than the conductor. Contact surfaces are finished by grinding, sand blasting and machine brushing (a Royal standard for over 20 years) to provide multiplicity of point contact. Silicon Bronze bolts are standard —big ½" minimum dia. on conductors 500 MCM or ½" IPS tubing and larger and for studs 1⅛" dia. and larger. Royal is *always* on emergency call to deliver stud connectors to you on the shortest notice possible.

FREE HANDBOOK 24 pages, filled with useful information on stud connector selection . . . only book ever published devoted *exclusively* to subject. Make it part of your reference library. No obligation . . . write TODAY.

ROYAL

A part of the arsenal of AMERICAN POWER PRODUCTION

ROYAL ELECTRIC MANUFACTURING CO., INC.
1122 EAST 87TH STREET • CHICAGO 19, ILLINOIS
Designers and Manufacturers of Power Switching Equipment and Special Electrical Devices

Built-In Vacuum Cleaner Introduced by Centralvac

Described as a new concept in home cleaning, a built-in vacuum cleaning system has been introduced by the recently formed Centralvac Corp, 1912 Dayton Blvd, Chattanooga, Tenn. Powered by a 1-hp motor, the unit can be located under the floor, in the attic, basement or utility room. It reportedly vacuums both wet and dry surfaces, giving it additional uses about the home.

A light-weight cleaning hose plugs into a wall outlet of the suction unit and, at the same time, makes an electrical connection to operate the motor. When unplugged, the waste is automatically flushed down the sewer and the unit shuts itself off, according to a company spokesman.

Nuclear Notes

Zirconium Test Plant Planned

Kennecott Copper Corp, following licensing arrangements with Horizons Titanium Corp of Princeton, N. J., will soon begin design and construction of a test plant to produce zirconium. Operation at the Cleveland, Ohio, plant will start late next year. The agreement permits Kennecott to use the fused electrolytic method developed by Horizons for the metal's production. The move ties in with Kennecott's jacketing technique for making tubes for atomic plants and reactors.

Sphere Begun for Commonwealth

A 190-ft diam steel sphere for Commonwealth Edison Co's Dresden Station near Chicago will be built by Chicago Bridge & Iron Co. Contract was awarded by Bechtel Corp, engineer-constructor. General Electric Co is the project's prime contractor. The sphere will house GE's dual-cycle boiling water reactor which will power the 180,000-kw station.

Reactor Completes 66-Day Run

On single charge of uranium fuel the land-based prototype of the Nautilus completed a 66 day and night run earlier this month. The pressurized water reactor operated at 100% during the time, providing data which will be used in future designs for nuclear power plants and planes.

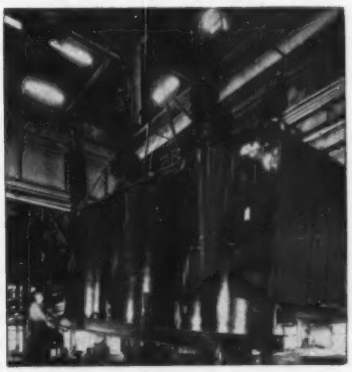
M&M BRIEFS

Alco Products, Inc, Schenectady, N. Y., was awarded a $494,147 contract for trash racks and suspension metal work on 34 St. Lawrence diversion tunnel gates. Deliveries are scheduled for September, 1957.

Minnesota Mining & Mfg Co is using an electron microscope, which magnifies over 300,000 times, developed by Radio Corp of America. The device is used in studies of chemicals and raw materials going into 3M's electrical and other products.

Westinghouse Electric Corp has reported these items:

- An order for two flash-type water evaporators, each with 1.26-million gal/day capacity, which will double production of drinking water for Kuwait, on the Persion Gulf. A two-stage, U. S. prototype built to one-sixth scale will be used for scaling, corrosion and erosion study.
- Orders for generating machines include a 156,250-kw unit sold to Kyushu Electric Power Co of Japan; a $3-million contract for a 110,000-kw unit scheduled for 1958 delivery to Public Service Co of Colo.; and a 275,000-kw turbogenerator for the third unit at Tennessee Valley Association's Gallatin Steam Plant, which will cost $6.05 million.
- Weather conditions from −100 to 500 F will be simulated in a test chamber at Baltimore, Md. The facility, built by York Corp, will test airborne electronic systems.
- Described as the first of its rating ever built, the first of nine three-pole 115-kv, 10,000-Mva power



circuit breakers was shipped by the company. The units are shipped completely assembled (see photo) on a unit base ready for installation.

Alcoa® Aluminum meter shields perform three important functions that can save real money and embarrassment for electric utilities:

1. They protect pre-1946 meters against damage from lightning surges. These surges affect damping magnets . . . cause meters to run fast.

2. They protect meters from sunlight . . . keep them from 40° to 50° F cooler. This is especially important with delicate demand meters. Cooler running means longer life and greater accuracy.

3. They add physical protection and improve appearance.

Typically, it costs about $1.50 to inspect a meter . . . another $5.00 to remove, repair and reinstall.

When you install Alcoa Aluminum meter shields, you can extend repair cycles, protect the meter for longer periods and assure maintaining its accuracy.

For complete details and prices, contact your nearby Alcoa sales office. Aluminum Company of America, 2306-J Alcoa Building, Pittsburgh 19, Pa.

THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

Your Guide to the Best in Aluminum Value

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

NEWS ABOUT PEOPLE

Welch Named to VP Post

J. LEO WELCH

New vice president in charge of operations for Niagara Mohawk Power Corp is J. Leo Welch, who will assume responsibility for all gas and electric operations of the utility.

Welch has spent his entire 45-year utility career with Niagara Mohawk and predecessor companies in central New York. He was named to head gas and electric operations for the Syracuse-Oswego Division in 1941. Three years later he was appointed general superintendent of electric operations for Central New York Power Corp. He was named to his most recent post of general superintendent of gas and electric operations for Niagara Mohawk's Central Division in 1952.

Welch is president and a director of St. Lawrence Power Co, Ltd, and vice president and a director of Beebee Island Power Co.

CARL W. APPLEFORD

PG&E Advances Appleford

Carl W. Appleford has been appointed chief civil engineer of Pacific Gas & Electric Co. A member of the company's engineering department since 1920, he succeeds Henry V. Lutge, who retired July 1.

Appleford, previously supervising civil engineer, will now have charge of civil engineering and economic investigation and designs of hydroelectric developments. He will also be responsible for civil engineering connected with planning and designing of steam power plants and other facilities in the company's 47-county system. Appleford is a graduate of the University of California.

Lutge retired after 36 years in the company's service. Before his appointment as chief civil engineer in early 1952 he served in all phases of PG&E's civil engineering activities.

PERSONAL BRIEFS

Executive staff appointments following recent retirement of Kansas Gas & Electric Co Vice President **Frank Barr** include assumption of personnel department responsibilities by **Fred M. Kimball,** vice president, who continues to head company sales. **Glen L. Montague** becomes personnel administration director and **K. M. LaRue** new general sales manager.

A. Warren Egger has been elected comptroller and assistant secretary, and **Herbert A. Blair** secretary and assistant comptroller of Central Illinois Light Co. They succeed **R. N. White,** former comptroller and secretary, resigned. **John V. Miller** and **Robert L. Ashley** were both elected assistant comptroller and assistant secretary.

John M. Warner is new purchasing agent of Philadelphia Electric Co . . . Utah Power & Light Co has appointed **Darcia H. White** assistant to **W. A. Huckins,** business development manager.

New assistant treasurers of Pacific Gas & Electric Co, effective Oct 1, are **Hoeter C. Nelson** and **Donald L. Bell.** Nelson, also assistant secretary, succeeds **O. H. Barthol,** assistant treasurer and cashier, who retires Sept 30.

After 72 years with Blackstone Valley Gas & Electric Co, **Capt. William McGregor** has retired as vice president. He reportedly holds the record of having the longest service of any public utility executive in the U. S.

W. V. Van Gilse is newly appointed superintendent of Cincinnati Gas & Electric Co's Walter C. Beckjord station to succeed the late **Frank P. Corrigan . . .** Lower Colorado River Authority has designated **John H. Kight** treasurer and **F. N. Warwick** chief engineer of the Comal Plant.

Virginia Electric & Power Co has announced the following appointments: **C. E. Anderson,** sales promotion manager; **Karl E. Kraemer,** system sales staff engineer in Richmond; **C. A. Smith,** director of residential and rural sales; **W. P. Johnson,** Richmond district sales supervisor; **M. C. Stribling,** Norfolk district sales supervisor; and **R. W. Carroll,** Potomac district sales supervisor.

Hughes and Watkins Are Elected Kuhlman VP's

ARTHUR V. HUGHES

Kuhlman Electric Co has named Arthur V. Hughes vice president and director of engineering and Joel H. Watkins vice president of sales.

Hughes, director of engineering since 1951, previously served in research engineering at Battelle Institute, transformer development engineering for Westinghouse Electric Corp, and test engineering for General Motors Corp and General Electric Co. He received his electrical engineering and master's degrees from Massachusetts Institute of Technology.

Watkins, sales manager for the past three years, was formerly vice president of a Virginia consulting firm. He was also production and personnel manager for J. W. Beardsley's Sons and once served in GE's Transformer Engineering Division.

JOEL H. WATKINS

ROBERT D. YOEMANS

WWP Appoints New Secretary

Newly elected secretary of Washington Water Power Co is Robert D. Yoemans, Seattle attorney and formerly a member of the Washington Public Service Commission. He succeeds Benjamin J. Lindsay, secretary since 1944, who will retire Sept. 30. Lindsay has also been property agent since 1948.

Yoemans, a graduate of University of Washington with degrees in law and in science, was engaged in private law practice from 1939 until his 1953 appointment by Gov Arthur B. Langlie to Washington State PSC. There he served as a member of the executive committee of the National Association of Railroad and Utility Commissioners, and as a member of the special committee on legislation. He has also devoted considerable time to the public utilities section of the American Bar Association.

Veryl Hoover, assistant vice president of Pacific Power & Light Co, has been named general manager of the Wyoming Division to replace **W. D. Johnston,** vice president, retired.

Concurrent with the reorganization of Westinghouse Electric Corp's Steam Division, four managers have been appointed to head the new product operating departments. They are **A. I. Ponomareff,** heat transfer apparatus; **R. C. Twombly,** small turbines; **L. M. Eikner,** large turbine; and **R. T. Nalle, Jr,** industrial gas turbine. Reporting to Eikner will be **D. W. R. Morgan, Jr,** large turbine sales manager; **D. R. Jenkins,** medium turbine sales manager; **J. C. Spahr,** large turbine engineering manager; **W. T. Manning,** medium turbine engineering manager; and **A. F. Porter,** manufacturing manager for medium and large turbines. Twombly will have reporting to him **K. S. Kramer,** engineering manager; **F. Anthony,** sales manager; and **J. J. Fasolas,** manufacturing manager.

Noel E. Kittell, chemist and wood preservation engineer of Joslyn Manufacturing Co & Supply Co, has been elected president of the American Wood-Preservers' Association

Chase Brass & Copper Co has promoted **Robert C. Smith** from assistant treasurer to treasurer . . . **Joseph D. Gavin** is new manager of the sheet and strip order department of Joseph T. Ryerson & Son, Inc.

OBITUARY

Malcolm Montrose Graham, 89, former assistant treasurer of Consolidated Edison Co of New York, died recently at his home in Flushing, Queens. Mr. Graham was associated with Con Edison and predecessors for 53 years.

Marshall Lasher, 63, vice president and a director of the Pacific Coast Division of Hubbard & Co, died recently in Oakland, Calif.

Glen R. Trumbull, associated with the electric industry throughout his life until his retirement seven years ago, died recently in Flemington, N. J., after a heart attack. He served as manager of the Better Light Better Sight Bureau from 1934 to 1949, and before that held sales posts in the industry.

Just 4 Simple Steps to Install

ALLIS-CHALMERS Core and Coil Replacement Assemblies

1. Attach brackets on top and bottom of side frame, using bolts in frame. If old anchoring studs or lugs are not already suitably located in tank wall, weld new ones in position.

2. Position core and coil assembly over tank. Adjust expandable bottom brackets to meet side of tank wall to assure accurate fit.

3. Lower assembly into tank and adjust top brackets to meet lugs in side wall. Anchor in place.

4. After cutting leads to required length, braze the terminals to the leads (all leads and terminals are identified).

You can use Allis-Chalmers replacement units in any type transformer tank. They are packaged for convenience, immersed in oil in specially designed containers, which protect against moisture or damage during transportation. You get complete instructions with each unit.

Assemblies available in ratings 25 kva and smaller, 15 kv and below, and conform strictly to NEMA standards. Use them in either conventional or protected types. Provision for mounting low voltage breaker, and a winding to operate signal light are standard.

★ ★ ★

GET ORIGINAL FACTORY QUALITY. Call your nearby A-C office for information. Or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin, for Bulletin 61B6345A.

A-4884

ALLIS-CHALMERS

PLM Type AC 600-v Terminator for armored cable

happy ending

FOR ARMORED CABLE RUNS

TERMINATORS from PLM

Type ACS Terminator for installations to 15 kv

Type BAC Bracket for wall or ceiling mounting

● Planning is easy...installation easier...with armored cable fittings from PLM! PLM Terminators are made for installations to 15 kv...in cast aluminum or bronze...eliminate need for bulky, costly potheads in many applications. PLM Unit Package Kits speed up the job, too...insure correctly designed terminations and splices at every point.

Put PLM in your plans for quick action on both standard and special needs. Write for catalog.

PLM *Products, Inc.*

3873 West 150th St. • Cleveland 11, Ohio

WIRE AND CABLE FITTINGS AND ACCESSORIES

Armored Cable Terminators • Splicing and Terminating Kits • Conduit Ventilators

SALES ASSIGNMENTS

COMPANY STAFFS

Bristol Co's Chicago office has named S. E. Gewin as district manager. Walter Messner succeeds Gewin as manager of the St. Louis office.

Chase Brass & Copper Co has announced the following appointments: Herman H. Kremer, staff manager of rod and wire; Thomas E. Cox, district manager at the Charlotte, N. C., branch; Allan R. Armstrong, staff manager of tube sales; and John J. Vreeland, staff manager, sheet and strip.

Dow Chemical Co has assigned Edward T. Coon as product manager of industrial herbicides in Agricultural Chemicals Sales.

General Electric Co has named Wayne E. Evans to head it's new microwave sales office. . . . A. F. Dobbrodt is Pacific Northwest sales representative for GE's metallurgical products department. . . . GE's first Alaskan branch supply and apparatus house has appointed George H. Smith manager under O. B. Hubenthal, regional manager.

Hotpoint Co's television receiver department has 11 new district managers: Mitchell M. Werwa, Los Angeles; F. Gene Abrams, Cleveland; Harold B. Avery, Charlotte, N. C.; Horace T. Presley, Dallas; Paul E. Sullivan, Boston; Martin J. Toohill, Chicago; Jacob L. Miller, Pittsburgh; Donald F. Johnston, Atlanta; William H. Geddes, Cincinnati; Bartley C. Furey, San Francisco; Herbert E. Delp, Kansas City.

Milbank Manufacturing Companies have appointed William T. Martin as general manager.

Sangamo Electric Co has moved its Electronic Capacitor Division's sales department from Marion, Ill., to Springfield, consolidating Power Equipment and Electronic Capacitor Divisions. James H. Patton is vice president in charge of Power Equipment Division and H. L. Kunz, vice president of Components Division. J. H. Williams is general advertising manager for both divisions.

Sylvania Electric Products, Inc, has designated John A. Mayberry as northeastern district manager of its electronic products distributor sales.

Wagner Electric Corp has named Russell E. Bryant to manage the electrical division of its Los Angeles branch. He succeeds Leonard G. Tandberg, retired.

Westinghouse Electric Corp's new Boston district manager for the Sturtevant Division is Charles V. Porter. . . . J. N. Pierce is new manager of the apparatus sales office in Little Rock, Ark. . . . Westinghouse Electric Supply Co has promoted J. J. Riggs sales manager of major appliances at headquarters.

NEWS IN BRIEF

(*Continued from page* 76)

J. D. Ross substations . . . **Pacific P&L** has awarded three contracts for construction of a $4.5-million, 161-kv line between the Yellowtail Dam site in southern Montana to Casper and Glenrock, Wyo. Scheduled for operation by Dec. 31. PP&L also has applied for authority to build a $1.2-million, 161-kv line between Yellowtail and Buffalo, Wyo.

Illinois Commerce Commission has okayed a **330-kv Commonwealth Edison line** to run from Goodings Grove (southeast of Chicago) to Indiana state line. **AG&E** will help build the 90-mile, $25-million line; completion set for summer of 1958.

DISTRIBUTION

Pennsylvania P&L has completed a $50,000 supply line project to provide more power for industries in southern section of Wilkes-Barre . . . **Louisville G&E** has won approval of Planning and Zoning Commission to situate a substation in Breckinridge Village, but final approval must come from Fiscal Court. Residents have opposed. Edward Stone, their counsel, charged the utility with "failure to plan ahead," and insisted that the company buy substation sites "well ahead of development" before the land is platted and lots sold.

South Carolina E&G is erecting a $500,000, 60-Mva substation in Columbia. Power to enter at 115 kv, leave at 34 kv . . . **Los Angeles Department of Water & Power** has started work on its first underground power distributing station, which will serve the Civic Center area. It is to cover nearly 16,000 sq ft with roof flushed level with landscaped grounds. Building will cost $1.3 million; to be in service by October, 1957.

HYDRO

World's largest pump-turbine is now operating at **TVA's Hiwassee** plant. Waterwheel's diameter is 266 in. . . . **Army Engineers** schedule proposed Ice Harbor Dam (on the Snake River) to go on the line by 1961, reports Col Myron E. Page, Jr., Walla Walla (Ore.) district engineer. Cofferdam now started.

Pacific P&L, Portland, Ore., **and PUD No. 1** of Cowlitz County, Wash.,

(*Continued on page* 170)

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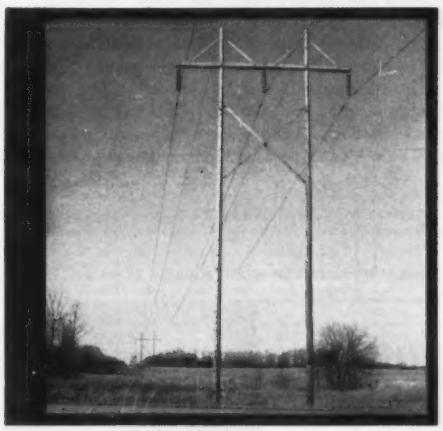

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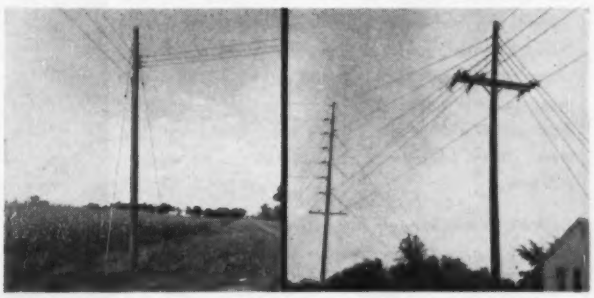

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NEWS IN BRIEF

(*Continued from page* 169)

have applied jointly to FPC for licenses to develop the proposed Swift hydroelectric project on the Lewis River. PP&L previously had applied for permission to construct entire project. Under new proposal, PP&L will build Swift No. 1 ($44 million), and PUD will build Swift No. 2 ($12 million). **Swift No. 1 statistics:** 410-ft-high dam; 12-mi reservoir; 1,580-ft power tunnel branching into three penstocks; three 87,000-hp turbines; 63-Mw machines. **Swift No. 2 statistics:** power canal and forebay extending 3½ mi between the two developments; powerhouse to be at upper end of PP&L's Yale Project reservoir; two 46,000-hp turbines driving 33.7-Mw machines.

Chelan County PUD, Wenatchee, Wash., is ready to start work on Rocky Reach Dam on Columbia River. First-step construction may be done by Maryland firm . . . **Montana Power Co's** Harry Cochrane Dam on Missouri River near Great Falls will get underway soon. Will cost $15 million, will generate 60,000 kw, and should be finished in 1957 . . . A 30-Mw station on the Pearl River northeast of **Canton, China,** is being built; to supply power in 1958 . . . **Siberia** is getting a 660-kw hydroplant near Irkutsk.

A site for John Day Dam on Columbia River has been selected. It will be near Schofield Rapids, about 3 mi downstream from mouth of John Day River . . . **Fort Randall Dam** at Pickston, S. D., has been completed. It is first project to harness Missouri River under Flood Control Act of 1944. It has eight 40-Mw generators.

Lightning is believed to have caused a generator at **Pacific P&L's** Joseph hydro plant to drop its load recently in an incident that may cost the company thousands of dollars. The governor apparently acted to shut down the turbine, but was prevented from doing so completely—possibly by an obstruction in a turbine gate. The turbine apparently sped up, breaking the fly wheel and damaging the 1-Mw unit.

British Columbia Electric Co has been authorized to enlarge its 186,000-kw Bridge River plant by an additional 240,000 kw. The addition will be made possible through construction of a second 2½-mi tunnel diverting Bridge River through a mountain into Seton Lake, and another 150-ft-high dam, to be downstream from the 282-ft LaJoie Dam.

Agreement Being Forged for Utah 'Uranium Circuit'

Utah Power & Light Co and Texas Zinc Minerals Co are completing negotiations for a 70-mi, $1-million extension of the Salt Lake utility's "uranium circuit" in southeastern Utah.

Under the plan now being discussed, Utah Power would run its 69,000-v line from Monticello into Blanding, San Juan County, at the utility's expense.

Construction of the line from Blanding to Mexican Hat, where Texas Zinc is building a big uranium mill, would be paid for by the mining affiliate of the Texas Co and New Jersey Zinc Co.

Special equipment will be required to keep voltage up. Nearest generating station on the "uranium circuit" is the (mine mouth) Carbon Plant at Castle Gate, Carbon County.

But if demand in the growing southeast portions of Utah continues to increase, Utah Power reportedly will consider construction of steam-electric generating units in area—possibly near Moab or Green River.

B.C. Surveyors to Find Site for Mica Creek Dam

After talks with Canadian Resources Minister, the British Columbia government decided to run its own engineering survey along the Columbia River to pinpoint a site for the proposed $247-million Mica Creek Dam.

Premier Bennet stipulated that the Water Rights branch of the provincial government conduct the survey and that it should be "thorough and complete"—covering both engineering and economic factors, including the amount of water which can be impounded.

Lands and Forests Minister Ray Williston confirmed that an engineering staff is being assembled for the job now. The survey will start soon, he said.

Dyersburg Votes for TVA

Dyersburg, Tenn., residents voted 620-184 recently to close their 50-year-old municipally owned electric generating plant and to sign a contract with Tennessee Valley Authority to supply the city's power needs. It is said the move will save consumers $200,000 a year.

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THE SHORTAGE OF SCIENTISTS AND ENGINEERS:

What Caused It?

WHY is the United States confronted with a serious shortage of scientists and engineers?

One reason, discussed in earlier editorials in this series, is that the increasingly complex technology needed for national security and for an expanding economy has raised enormously the demand for technically trained people.

But it is clear also that too little has been done to increase the supply of scientists and engineers and to make most effective use of the limited number now available. It is with this second reason for the shortage that this editorial deals.

Too few bright young people have been attracted to careers in the sciences and engineering. Many with technical training have been leaving these professions, with the exodus from teaching being especially alarming. And the technical talent now employed in industry, government and education is, in too many instances, being utilized less effectively than it might be.

Paying for a Miscalculation

A legacy of the depression provides part of the explanation for the current shortage of young people entering scientific and engineering careers. Because of low birthrates in the 1930s, there are now about one million fewer boys and girls of college age than there were in the early 1940s. Not until 1960 will there be as many in the 18-21 age group as in 1945. And from the brightest young people of these ages must come, not only scientists and engineers, but the new members of all the professions needed by our growing economy.

A miscalculation in the late 1940s, when our future needs in various occupations were being gauged, provides another part of the explanation. Occupational counselors and high school students were advised that, because of heavy postwar enrollments in engineering and other technical fields, "it is likely that the shortages of trained men will be alleviated in a few years."*

Instead of being alleviated, however, the shortages became more acute. Job opportunities grew rapidly, while graduating classes dwindled. Fewer than half as many students received degrees in engineering in 1955 as in 1950, the peak postwar year. The trend has been reversed, but graduating classes will not be large enough to narrow the gap for several years.

Lost Talent

Beyond these temporary conditions, there is another explanation for the failure of the number of scientists and engineers to keep pace with our rising needs. This is the staggering loss between high school and college of young people with the talent to be successful in science and engineering. **Last year between 60,000 and 100,000 high school graduates of college ability failed to enroll in college for financial reasons and perhaps an additional 100,000 did not enter college because of lack of interest.†**

Of the most intelligent 20 percent in the group of college age, fewer than half enter college and only about a third graduate from college. Educational authorities estimate that fewer than 2 percent of those in the college age group who are mentally equipped to obtain Ph. D. degrees will actually obtain such degrees.

Another crucial stage is in the high

*U. S. Bureau of Labor Statistics, *Occupational Outlook Handbook* (Bulletin 940), p. 63.

†Charles C. Cole, Jr. (assistant dean, Columbia College, Columbia University), *Higher Education*, November 1955.

schools, where future scientists and engineers receive their first training in science and mathematics. There are serious weaknesses and signs of deterioration in this vital part of our educational system.

One-quarter of all American high schools offer no chemistry or physics. One-quarter offer no geometry. In many of the schools offering science and mathematics courses, the quality of instruction is low. Last year in the New York City school system alone more than 10,000 students were in science classes taught by teachers who were not trained in science.

This is a situation that threatens to become much worse. Between 1950 and 1955 the number of graduating teachers qualified to teach high school mathematics dropped 53 percent and those qualified to teach science dropped 59 percent. Furthermore, only about 60 percent of the graduates certified to teach mathematics or science in 1955 entered teaching as a career.

On the students' side — partly because of inadequate guidance programs — there has been a drift away from science and mathematics courses. The result of low student interest, and poor high school programs, in science and mathematics is virtually to foreclose careers in science and engineering to many bright young people. They miss the necessary basic training. Many who do attempt to obtain college training in these fields are ill-equipped. Engineering school deans report that fully half of their students enter with deficiencies in mathematics.

Misuse of Trained People

Scientific and engineering careers have long had a reputation for low salaries and limited opportunities for advancement. In recent years starting salaries have sky-rocketed and have been accorded wide publicity. But unfortunately there has been much less improvement in the salaries paid experienced engineers and scientists, especially in government and education. This has lowered the morale of experienced men and provided an incentive to desert engineering and research positions for higher paying jobs in sales or management.

Engineers and research scientists complain also that too much of their time now is spent on tasks that draftsmen and technicians could perform. Unfortunately for easy solution of this problem, however, there is an acute shortage of technicians as well. Worse still, there are indications that some companies in industries using large numbers of engineers have gobbled up technical manpower at a faster rate than they can effectively employ these scarce people.

Another drain on the supply of newly-trained scientists and engineers is military service. About 8,000 of this year's 27,000 engineering graduates were in ROTC programs and committed to active duty after graduation. Dr. A. W. Davison, chairman of the Engineering Manpower Commission of the Engineers Joint Council, says that in most cases no attempt is made by the Armed Services to assign these young officers to duties for which their engineering education specifically prepared them. They are not only withheld from industry and education for two years but also are not utilized in defense programs requiring more engineers and research scientists.

Some of the causes for the present shortage of scientists and engineers — bad advice a few years ago and a college age group held down by depression birthrates in the 1930s — are gradually being overcome. But others, such as the deterioration of science and mathematics training in our public schools and the many instances of ineffective utilization of scarce technical talent, enjoy no such prospect of automatic correction. The final editorial in this series will deal with some practical suggestions for meeting these problems.

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Donald C. McGraw

PRESIDENT

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MEETINGS CALENDAR

SEPTEMBER

• **NORTHWEST PUBLIC POWER ASSOCIATION, INC**—49th Annual Meeting, Hotel Gearhart, Gearhart, Oregon, Sept. 5-6; Meter School, Oregon State College, Corvallis, Oregon, September 10-14; Accounting Section, Cascadian Hotel, Wenatchee, Washington, September 11-14.

• **EDISON ELECTRIC INSTITUTE**—Residential Lighting Committee, St. Louis, Mo., Sept. 6; Residential Promotion Committee, EEI Headquarters, N. Y., Sept. 6-7; Home Service Committee, St. Louis, Mo., Sept. 12-13; EEI-AGA Accounting Division Organization Meeting, Edgewater Beach Hotel, Chicago, Ill., Sept. 13-14; Industrial Power Heating Group, Belmont Plaza, N. Y., Sept. 13-14; Commercial Division Executive Committee, Hotel Roosevelt, N. Y., Sept. 14; Street Lighting Committee, Hotel Statler, Boston, Mass., Sept. 19; Industrial Relations Round Table Conference, Hotel Statler, Boston, Mass., Sept. 17-19; Dealer Coordination Committee, Syracuse Hotel, Syracuse N. Y., Sept. 19; Purchasing and Stores Committee, Executive Committee, EEI Headquarters, N. Y., Sept 21; Market Research Committee, Cleveland, Ohio, Sept. 21; Meter and Service Committee, Purdue University, Lafayette, Indiana, Sept. 24-26; Farm Group Committees, Belmont Plaza, N. Y., Sept. 27-28; EEI-AGA Taxation Accounting Meeting, William Penn Hotel, Pittsburgh, Pa., Sept. 27-28.

ILLUMINATING ENGINEERING RESEARCH INSTITUTE—Research Symposium on Light, Seeing, Living, Cornell University, Phillips Hall, Ithaca, N. Y., Sept. 13-15.

MARYLAND UTILITIES ASSOCIATION—32nd Fall Conference, Cavalier and Sir Walter Hotels, Virginia Beach, Va., Sept. 14-15.

PUBLIC UTILITIES ASSOCIATION OF THE VIRGINIAS—38th Annual Meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., Sept. 14-15.

AMERICAN SOCIETY FOR TESTING MATERIALS—Second Pacific Area National Meeting, Statler Hotel, Los Angeles, Calif., Sept. 16-22.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—3rd Annual Electrical Conference of the Petroleum Industry, Kansas City, Mo., Sept. 17-19; Fifth Annual Industrial Electronics Symposium, sponsored jointly with the Institute of Radio Engineers, Hotel Manager, Cleveland, Ohio, Sept. 24-25.

ILLUMINATING ENGINEERING SOCIETY—National Technical Conference, Hotel Statler, Boston, Mass., Sept. 17-21.

INSTRUMENT SOCIETY OF AMERICA—11th Annual Instrument-Automation Conference and Exhibit, New York Coliseum, Sept. 17-21.

MISSOURI VALLEY ELECTRIC ASSOCIATION—Accounting Conference, Lassen Hotel, Wichita, Kansas, Sept. 20-21.

SOUTHEASTERN ELECTRIC EXCHANGE—Engineering & Operations Section, John Marshall Hotel, Richmond, Va., Sept. 20-21.

ATOMIC INDUSTRIAL FORUM, INC—3rd Annual Forum Conference and 2nd Annual Trade Fair, Morrison Hotel and Navy Pier, Chicago, Ill., Sept. 24-28.

PENNSYLVANIA ELECTRIC ASSOCIATION—49th Annual Meeting, Hotel Wm. Penn, Pittsburgh, Pa., Sept. 25-26.

ELECTRIC COMPANIES PUBLIC INFORMATION PROGRAM—Steering Committee, Blackstone Hotel, Chicago, Ill., September 26; Workshop Conference, Blackstone Hotel, Chicago, Ill., Sept. 26-28.

OCTOBER

EDISON ELECTRIC INSTITUTE—Prime Movers Committee, Radisson Hotel, Minneapolis, Minn., Oct. 1-3; Area Development Committee Meeting, Oct. 3, and Area Development Committee Workshop, Radisson Hotel, Minneapolis, Minn., Oct. 4-5; Electrical Equipment Committee, Hotel Statler, Cleveland, Ohio, Oct. 15-16; Transmission and Distribution Committee, Hotel Statler, Buffalo, N. Y., Oct. 18-19.

ILLINOIS INSTITUTE OF TECHNOLOGY—12th Annual National Electronics Conference, sponsored jointly by AIEE, Institute of Radio Engineers, University of Illinois, and Northwestern University, Hotel Sherman, Chicago, Ill., Oct. 1-3.

NATIONAL ELECTRONICS CONFERENCE—12th Annual Conference and Exhibition, Hotel Sherman, Chicago, Ill., Oct. 1-3.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Fall General Meeting, Morrison Hotel, Chicago, Ill., Oct. 1-5.

CANADIAN ELECTRICAL MANUFACTURERS' ASSOCIATION—12th Annual Meeting, Sheraton Brock Hotel, Niagara Falls, Ontario, Canada, Oct. 3-5.

INDIANA ELECTRICAL ASSOCIATION—Annual Convention, French Lick Springs Hotel, French Lick, Ind., Oct 3-5.

MISSOURI VALLEY ELECTRIC ASSOCIATION—Sales and Rural Conference, Hotel President, Kansas City, Mo., Oct. 3-5.

SOUTHEASTERN ELECTRICAL EXCHANGE—Sales Conference, Tides Hotel & Bath Club, St. Petersburg, Fla., Oct. 3-5; Accounting Meeting, Hotel Seville, Miami, Fla., Oct. 10-11.

STANDARDS ENGINEERS SOCIETY—Fifth Annual Meeting, Hotel Willard, Washington, D. C., Oct. 3-5.

INTERNATIONAL ASSOCIATION OF ELECTRIC LEAGUES—Sheraton-Cadillac Hotel, Detroit, Mich., Oct. 3-6.

• **PENNSYLVANIA ELECTRIC ASSOCIATION**—System Planning Committee, Skytop Lodge, Skytop, Pa., Oct. 1-2; Electric Equipment Committee, Arlington Hotel, Binghamton, N. Y., Oct. 4-5; Hydraulic Power Committee, Mountain View Hotel, Greensburg, Pa., Oct. 4-5; Systems Operation Committee, Penn Alto Hotel, Altoona, Pa., Oct. 10-11; Communications Committee Meeting, Fort Stanwix Hotel, Johnstown, Pa., Oct. 22-23; Relay Committee Meeting, Hotel Robert Treat, Newark, N. J., Oct. 25-26.

ROCKY MOUNTAIN ELECTRICAL LEAGUE—Annual Fall Convention, Broadmoor Hotel, Colorado Springs, Colo., Oct. 7-10.

INTERSTATE POWER CLUB—Hotel Martinque, New York, Oct. 8.

ILLINOIS INSTITUTE OF TECHNOLOGY—Conference on Computer Applications, Chicago, Ill., Oct. 9-10.

INTER-INDUSTRY FARM ELECTRIC UTILIZATION COUNCIL—National Power Use Workshop, Milwaukee Auditorium, Milwaukee, Wis., Oct. 15-16.

IOWA UTILITIES ASSOCIATION—Annual Management Conference, Hotel Fort, Des Moines, Iowa, Oct. 15-16.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Electrification of Machine Tools Conference, Sheraton-Gibson Hotel, Cincinnati, Ohio, Oct. 22-24.

AMERICAN STANDARDS ASSOCIATION—38th Annual Meeting and 7th National Conference on Standards, Hotel Roosevelt, New York, Oct. 22-24.

UNIVERSITY OF TEXAS—Ninth Power Distribution Conference, University Batts Auditorium, Austin, Tex., Oct. 22-24.

NATIONAL SAFETY COUNCIL—44th National Safety Congress & Exposition, and Electrical Equipment Section, Conrad Hilton Hotel, Chicago, Illinois, Oct. 22-26.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS—South Central Region Meeting, M & M Building, Houston, Texas, October 23-26.

NORTHWEST PUBLIC POWER ASSOCIATION—Power Use Section, Franklin PUD Auditorium, Pasco, Wash., Oct. 25-26.

MONTANA STATE RURAL ELECTRIC COOPERATIVE ASSOCIATION—Annual Meeting, Lewiston, Mont., Oct. 29-31.

NOVEMBER

LOUISIANA POLYTECHNIC INSTITUTE—Fifth Annual Instrumentation Conference, Ruston, La., Nov. 1-2.

NATIONAL RURAL ELECTRIFICATION COOPERATIVE—Region Nine Annual Meeting, Davenport Hotel, Spokane, Wash., Nov. 12-13.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION—Annual Meeting, Traymore Hotel, Atlantic City, New Jersey, Nov. 12-16.

EDISON ELECTRIC INSTITUTE—Industrial Relations Committee, EEI Headquarters, New York, N. Y., Nov. 15; Accident Prevention Committee, Statler Hotel, Hartford, Connecticut, November 26-28.

• Additions this week.

EXCEEDS CLASS III SPECIFICATIONS

Wet or dry, pick your flashover test, NEW Kimble *Tempered* Glass insulators show flashover resistance exceeding A.I.E.E. requirements. In puncture tests, too, *Tempered* Glass insulators are outstanding. It has proved impossible to puncture them in air, even under the most severe maximum voltage impulses applied. Four years of field testing on more than 500 miles of line have produced no puncture failure. Even lightning surges have failed to damage them.

If it's on the pin, it's in service

In the event of shattering due to severe mechanical shock, insulator disintegrates into many small, non-sharp fragments. Trouble shooters can locate broken insulators—fast.

What's the secret? *Tempering*, a Kimble development in glass insulators that adds a new element to the many natural virtues of glass insulators. It's a Kimble production method that gives Kimble insulators a hard-compression surface layer that makes them strong enough to meet the severe test required. This great strength saves installation time because it's never necessary to loosen for line up with the conductor—they can always take another quarter-turn.

Why not see how *tempered* glass can cut your line maintenance costs. Write for folder. Address: Kimble Insulator Division, Owens-Illinois, Dept. EW-9 Box 1035, Toledo 1, Ohio.

KIMBLE INSULATORS
AN (O) PRODUCT

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GENERAL OFFICES · TOLEDO 1, OHIO

Poll Shows Public Favors Partnership by 3–1

Public power is rejected by 2-1 in opinion survey made in Puget Sound-Cascade region for Puget Sound Power & Light

A survey of public opinion on power issues was made recently in the Puget Sound-Cascade region for Puget Sound Power & Light Co. A selected cross-section of people were asked their opinions on a number of problems dealing with their broad philosophy on the power question.

Elmo Roper and Associates, the makers of the opinion survey, announced that the following three major points emerged from their study:

• "By nearly a 3-to-1 margin, people in the Puget Sound-Cascade region prefer the partnership concept of cooperation between public and private power to either alternative of all public or all private power. A substantial majority of people in the region feel that it is essential for private and public power to cooperate and work together instead of being at each other's throats.

• "By better than a 2-to-1 margin, people reject the idea of federal control of their electric utilities. By an almost identical count, people reject the idea of the private companies joining together to form a large private power combine in the Pacific Northwest. The alternative clearly preferred is locally operated utilities. This desire emerges as a powerful ingredient in the thinking of the people.

• "By better than 15 to 1, people in the Puget Sound-Cascade region approve the idea of the Puget Sound Utilities Council. They say they agree wholeheartedly with the idea of the five principal electric utilities in the area forming a council to plan power needs and to assure the Puget Sound region ample low-cost power."

PIP Workshop to Discuss Atomic Power

Nuclear power will be a chief topic of discussion at the 1956 workshop conference of Electric Companies Public Information Program. The meeting will be held Sept. 26-28 at Sheraton-Blackstone Hotel, Chicago.

Participants will attack the nuclear power topic in group discussions. They will also see a slide film, "The Atom, the Sun, and You," which was made by Arizona Public Service Co.

Among the prominent industry figures who will speak at the conference are: Donald S. Kennedy, president of Edison Electric Institute and Oklahoma Gas & Electric Co; Edwin Vennard, managing director of EEI; and Carl J. Forsberg, chairman of the PIP Steering Committee and president of Wisconsin Power & Light Co.

Other scheduled speakers are: Arthur Barnett, director of National Association of Electric Companies; Bob Considine, columnist and commentator; and Guy Jackson, president of National Reclamation Association.

PUBLIC RELATIONS BRIEFS

Meter Reader Scores for Public Relations

During a recent storm one of Wisconsin Public Service Corp's meter readers showed how well he realized that public relations is the responsibility of every employee. When a cow was knocked unconscious by a bolt of lightning, the meter reader went to work and revived the cow by applying artificial respiration. The cow was saved, and the farmer who owned her was grateful to the meter reader and the utility. If you are wondering how to apply artificial respiration to a cow, it's done by pumping the animal's front legs.

Newsletter Reproduces Full Color Ads

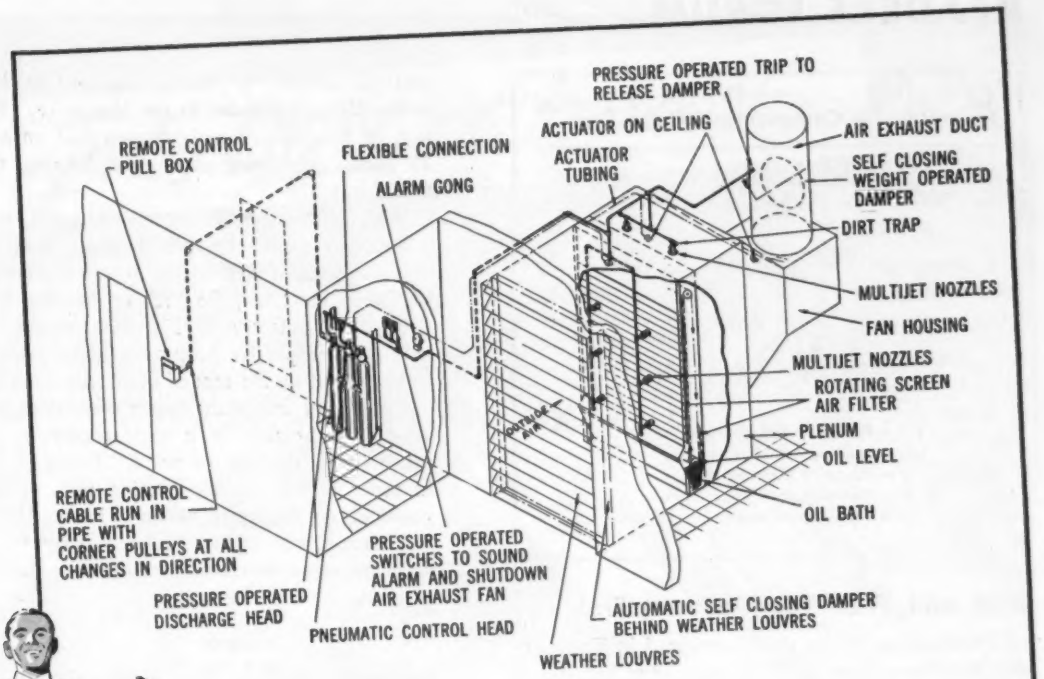
A quarterly newsletter for stockholders and community leaders of Arkansas Power & Light Co carries a full color reproduction of an advertisement published in national publications by the Arkansas Publicity and Parks Commission. The ad is one of a series published in Holiday and other magazines to attract more out-of-state visitors.

ECAP Will Run Its First Four-Color Ad

The Electric Companies Advertising Program's first four-color advertisement will appear in general magazines during September and October. The ad shows a radically designed home of the future with an outdoor swimming pool and garden that are completely encased in a transparent electrically heated oval shell. The picture shows snow and wintery winds outside and the family enjoying the pool and garden, courtesy of electric heat. The ad says that the independent electric power and light companies are doubling today's electric supply to help bring this new era of electricity.

Electricity Is the Favorite by 5-0

Iowa Electric Light & Power Co has received some unique proof that its public relations and advertising programs are hitting the mark. The Cedar Rapids Gazette helped furnish the proof when it interviewed five persons in the street and asked, "What modern convenience would you like least to do without?" All five persons selected electricity or electric appliances. In fact, many of their comments were almost a direct playback of some of the company's recent commercials. The utility felt that this was either a remarkable coincidence or the company was doing a better job of selling the value of electricity and its service than anyone had dreamed of.



GUARD OIL BATH AIR FILTERS WITH KIDDE ENGINEERED FIRE PROTECTION!

LOOK HERE—a fire hazard that could easily turn a building to a heap of cinders—*completely* protected by a tailor-made Kidde CO_2 Fire Extinguishing System! Kidde engineers haven't missed a trick!

At the first sign of fire, rate-of-temperature-rise detectors trigger the system, pressure-operated switches simultaneously close dampers, shut down fans and sound an alarm while fire-killing clouds of CO_2 stop the blaze in its tracks. What protection!

And what features Kidde systems have! Using safe, efficient CO_2, they leave no mess to damage equipment, nothing to clean up after a fire. And their special rate-of-temperature-rise detectors insure *complete* protection 24 hours a day. Kidde systems need no attendance, day *or* night!

Kidde systems have no falling weights, use no clumsy mechanical triggering methods. Pneumatic or Electrical Control Heads insure instant and complete CO_2 discharge. All moving parts of a Kidde system are self-enclosed for safety, need no replacement after a fire, have easy-to-read indicators which show at a glance whether system is "set" or "released." What's more, special Directional Valves let you guard more than one hazard from the same cylinder bank, giving you the most *versatile* protection on the market today!

It's easy to get the *best* in fire protection. For information about *your* specific problems, write Kidde today.

Kidde

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READERS FORUM

Equations for Computing Voltage Drop

$$\text{Volts drop} = \frac{(\text{kw})(\text{miles})(r + x \tan \theta)}{\text{kv}_r}$$

$$\% \text{ Volts drop} = \frac{(\text{kw})(\text{miles})(r + x \tan \theta)}{10(\text{kv}_r)^2}$$

$$\text{kv}_r = \frac{\text{kv}_s}{2} + \sqrt{\left(\frac{\text{kv}_s}{2}\right)^2 - \frac{(\text{kw})(\text{miles})(r + x \tan \theta)}{1000}}$$

Where:

kv_r = Receiving end kilovolts
kv_s = Sending end kilovolts
r = Resistive ohms per mile
x = Reactive ohms per mile
θ = Power factor angle

East and West Readers Spot Error

The formula shown above appeared in Engineering Reference Sheet 56-16 on page 98 of the Aug. 6 issue. The X was omitted at that time.

This error was called to our attention by Frank H. Wolf, 4002-50 SW, Seattle 16, Wash., and by A. J. Cyr, coordinating and consulting engineer, New Brunswick Electric Power Commission, Fredericton, N. B.

The latter also questioned the constant 0.5623 in the second last line of the table under 78-in. spacing, 0.95 pf, 266.8 M ACSR. The value should have been 0.5800.

Why Continental Wouldn't Go Along

To the Editor:

I noted with interest your news item on page 55 of your May 21 issue announcing release of the Electric Heating Design Manual by National Electrical Manufacturers Association's Electric House Heating Equipment Section.

In this manual, only one formula is acknowledged as being the proper one for all forms of electric heating. This thinking is completely inaccurate. There are four basic types of electric heating, viz, wire in the ceiling, straight Nichrome wire, Nichrome wire with fan, and glass heating panels. Each of the various types requires a different formula. This NEMA Committee contended that a "K" factor of 170 was the only correct factor for these four completely different types of electric heating, and they were adamant in their stand concerning same.

Using glass panels manufactured by Continental, the Bureau of Standards in Washington established that the correct "K" factor was 240 in their test house. Detroit Edison, in the March 19, 1956 edition of Electrical World, showed that on a test of 35 homes containing glass panel heating, the "K" factor was 270.

With facts such as these, we could not conscientiously go along with a group that claimed that all forms of electric heating were identical and all forms must use the "K" or heating factor of 170. A "K" factor of 170 puts electric heating in a non-competitive position in most areas of the country; and as the cost of electricity used in heating is a very important factor controlling the sale of electric heating, it is very necessary that the maximum heating factor or "K" factor be attained in order to put electric heating in a competitive position. As we are fortunate in having the highest "K" factor, we refused to be a party to the inaccurate representations set forth in the NEMA Manual.

B. A. Needham
President
Continental Radiant Glass Heating Corp
1 East 35th Street
New York 16, N. Y.

• Electrical World would be pleased to receive any other comments readers may have on this subject of such great importance at present.

It Is Indeed Noteworthy

To the Editor:

In your Aug. 6 "News in Brief" section it is stated that the Canadian atomic demonstration station is to be built at Des Joachimes, Quebec.

Des Joachimes is a large generating station on the Ottawa River, owned and operated by the Hydro-Electric Power Commission of Ontario, or, as it is better known, the Ontario Hydro.

The atomic plant is to be built with the cooperation of General Electric, and Atomic Energy of Canada, so I am told. And as you have said, work is to start this month. The location of the plant is on the present property of the Des Joachimes generating station, and the power produced will be fed into the network through the larger generating station's switching facilities.

To my knowledge, this makes the Ontario Hydro the pioneer in Canadian atomic power for electrical production, and it is a noteworthy accomplishment.

G. A. R. Sutton
c/o Ontario Hydro
McVittie Generating Station
Via: Parry Sound, Ontario, Canada

Photo courtesy Public Service Electric and Gas Company of New Jersey

J-M Transite Ducts go in quickly, easily and permanently

Quick, low-cost installation is promoted by Transite Ducts. The light, 10-foot lengths are easily handled . . . and readily joined with either Transite Couplings or J-M Plastic Couplings. Many fittings are available to simplify even the most complicated installation. The permanently smooth interior surface of these asbestos-cement ducts prevents cable injury, makes long pulls possible and simplifies cable replacement.

Incombustible Transite Ducts confine arc damage, protecting adjacent cables from heat and flame. Inorganic, nonmetallic, Transite Ducts are corrosion-resistant, immune to rust and rot and unaffected by electrolysis. These ducts dissipate heat faster, reducing I^2R losses, enable cables to carry heavier loads and prolong insulation life.

Available in 2 types: Transite Conduit for exposed work and installation underground without concrete encasement; and Transite Korduct for installation in concrete.

Let us send you more information about Transite Ducts. Just write to Johns-Manville, Box 14, New York 16, N. Y.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE® DUCTS

TRANSITE KORDUCT®—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement

TVA Reveals Lower Rates, Some Below 1933

New 'Rate Reduction' booklet published by the agency claims 10-20% reductions in electric rates charged by 53 of 152 distributing systems

Fifty-three of the 152 distributors of Tennessee Valley Authority power now are applying rates that are lower than the original TVA rates announced in 1933, the authority said recently.

A total of 34 systems have adopted rates that are 10% below the original schedules, and 19 are on rates that are 20% under the original basic rates.

A booklet on "Rate Reductions" just published by TVA shows that the public power systems serving the four major cities of the state continue to charge the basic TVA rates except in Memphis, Tenn., where the basic rate plus a surcharge is applied.

A table in the booklet shows that Chattanooga and Knoxville are two of the 25 systems distributing TVA power which never made a surcharge or amortization charge in addition to the basic rates. As of July 1 some of the systems still were making a surcharge or amortization charge.

Some of the systems in this area which have adopted retail rates below the TVA basic rates are Dayton, Tullahoma, Loudon, McMinnville, and Shelbyville in Tennessee, and Huntsville, Decatur, Scottsboro, Hartselle, Guntersville, Fort Payne, and Albertville in Alabama.

Distributors have made more than 200 rate reductions since the end of World War II, it is shown. These include removal of special charges made by some distributors to give financial assistance in early stages of development. They do not include the reductions that occurred when TVA power first came to each community.

During the 1956 fiscal year, which ended on June 30, thirty distributors reduced their rates. These rate reductions resulted in estimated first-year savings to consumers of $1½ million.

The booklet explains that although the original TVA rates were much lower than the average rates applied by utilities throughout the nation, they proved higher than necessary for many of the distributors. The primary objective set out for the power program in the TVA Act of 1933 is the sale of power at the lowest possible rates to encourage the widest possible use.

To meet this objective TVA developed near the end of World War II the two sets of retail rates that are lower than the original rates.

Lower rates have led to faster growth in power consumption and power revenues in the TVA area than in most other parts of the country, the report said. They are stimulating electricity sales in the same manner as low prices stimulate sales in other mass-production industries. How well the low-rate policy has worked is indicated by the increase in the average use of electricity by the residential consumers in the TVA area. On the average these consumers increased their use from 600 kwhr a year to 5,800 kwhr in the 23 years of TVA's power operations. In the same period the average use in the nation has increased less than half—from 600 kwhr to 2,850 kwhr, the report said.

The low rates are producing a generous level of earnings, TVA said. During fiscal 1955 the municipal and cooperative distributors of TVA power received total revenue of $139 million and had a net income of $25 million. Their return on the investment in power facilities averages about 8%, the report stated.

Los Angeles Will Increase Rates 5.9%

The Los Angeles, Calif., City Council has voted 8 to 5 for an ordinance permitting a 5.9% increase in power rates by the city's Department of Water & Power.

The new rate schedule, to go into effect sometime after Nov. 1, will bring an over-all increase in power revenues of about $4.8 million annually.

For the bulk of the department's residential customers (using 175 kwhr per month or less) the change would mean an increase of about 7¢ to 30¢ a month, while for about one-fourth of all domestic users (175 to 350 kwhr a month), rates will be up about 30¢ to 60¢. Power rate increases for most commercial and industrial customers will be around 1/10th of 1% per kwhr.

The department stated that additional revenue from the rate boost was made necessary by the rising costs of maintaining and expanding the power system.

While opponents to the new rates argued that profits are sufficient to make revenue bonds attractive to lending agencies, the department noted that the net profit curve has gone steadily downward (from 6.5% five years ago to 3.5% in the last fiscal year)—a problem that could affect future interest rates if no steps were taken to alleviate the situation. In addition, the department answered, the revenue bonding capacity for the power system has been exhausted, and the increased revenue will mean greater borrowing power.

Hearings on the rate increase were held earlier this year.

Missouri-Ohio PSC Rules on Speeded Depreciation

Empire District Electric Co has obtained an order from the Missouri Public Service Commission on the accounting treatment of accelerated depreciation under Section 167 of the Internal Revenue Code. The order was dated June 20.

This order, which is similar to the one prescribed for the Kansas City Power & Light Co, requires that taxes be normalized and the resulting deferral set up in a reserve account.

The commission noted that it "deems it unnecessary in this order to discuss the possibilities of accelerated depreciation." However, in the earlier order of Kansas City P&L the

commission had said that there were similarities between Sections 167 and 168 and that among the benefits which the company would obtain would be a deferral of the need to issue new securities for expansion.

In the case of the Ohio Edison Co, the Public Utilities Commission of Ohio ruled that the company shall use normalized taxes and a reserve method of accounting on the balance sheet. In substance, this order follows the commission's ruling on the Cleveland Electric Illuminating Co case, dated Dec. 29, 1955.

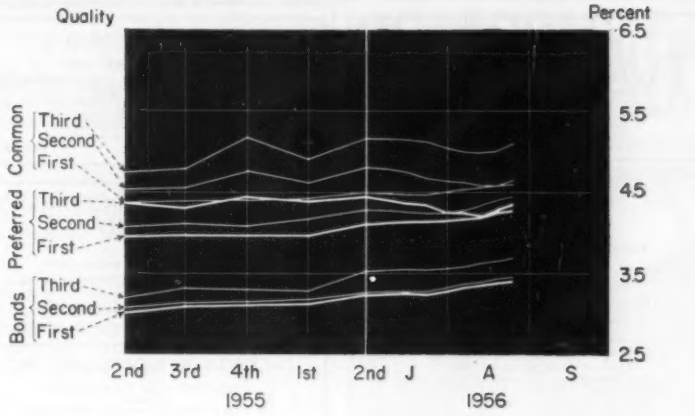
FINANCIAL BRIEFS

Southern California Edison Co is planning to sell 500,000 common shares through a group headed by First Boston Corp and Dean Witter & Co . . . **Bangor Hydro-Electric Co** will offer to its stockholders 52,796 common shares on a 1-for-6 basis, record Sept. 11 . . . **Hawaiian Electric Co** is proposing a public offering of 250,000 shares of $20 par cumulative preferred stock through an underwriting group headed by Dillon, Read & Co, and Dean Witter & Co . . . **Blackstone Valley Gas & Electric Co** is planning to sell competitively 25,000 shares of $100 par preferred stock, except that 1,430 shares will be subject to a subscription offer to be made, on a share for share basis, to commonholders other than Eastern Utilities Associates (parent), which owns 99.1% of the outstanding Blackstone common.

South Cle Elum, Wash., will vote next November on proposed sale of its municipal electric distribution system to the Puget Sound Power & Light Co, following receipt by the Town Council of a $65,452 bid from the private company.

Dividend Increases—Bangor Hydro-Electric Co will pay Oct. 20 a quarterly common stock dividend of 47½¢ a share as compared with 45¢ a share previously . . . Missouri Public Service will pay Sept. 12 a quarterly common stock dividend of one share for each 200 shares held . . . Gatineau Power Co will pay Oct. 1 a quarterly common stock dividend of 35¢ a share as compared with 30¢ in the previous quarter.

Today's Utility Yields (%) . . .



	Bonds			Preferred Stocks			Common Stocks		
Quality	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Aug. 23	3.41	3.46	3.70	4.27	4.43	4.59	4.35	4.63	5.09
Aug. 16	3.39	3.44	3.67	4.24	4.39	4.58	4.26	4.58	5.00
Aug. 9	3.37	3.41	3.64	4.20	4.33	4.57	4.21	4.59	5.00

Utility Earnings . . .

Company	Period Months Ended		Net Income 1956	Net Income 1955	Earnings Per Common Share 1956	Earnings Per Common Share 1955
Alabama Power	12	July	$14,934,028	$13,677,834	$....	$....
California Electric Power	12	June	3,310,969	2,723,421	0.98(a)	0.85(a)
Carolina Power & Light	12	July	9,886,572	8,673,900	1.71(b)	1.58(b)
Central Illinois Light	12	July	4,907,856	3,549,567	4.26(a)	3.05(a)
Central Power & Light	12	June	7,520,132	6,775,173	....	....
Central Vermont Public Service	12	July	1,407,834	1,388,018	1.27(a)	1.27(a)
Cincinnati Gas & Electric	12	June	15,782,864	13,404,936	2.05	1.81
Cleveland Electric Illuminating	12	June	19,310,431	15,277,193	2.71	2.11
Detroit Edison	12	July	27,988,793	24,885,135	2.46(a)	2.31(a)
El Paso Electric	12	June	2,328,303	2,121,451	2.44(c)	2.22(c)
General Public Utilities, consolidated all subsidiaries	12	June	27,826,103	24,852,758	2.87	2.56
Georgia Power	12	July	14,683,776	13,477,213	....	....
Gulf States Utilities	12	June	10,583,145	9,926,346	2.14(f)	1.99(f)
Houston Lighting & Power	12	July	16,303,481	13,812,092	2.73	2.30
Iowa-Illinois Gas & Electric	12	June	5,125,345	4,912,337	2.46	2.35
Kansas City Power & Light	12	July	9,048,259	7,263,520	2.77	2.16
Michigan Gas & Electric	12	June	671,885	567,761	4.03	3.33
Minnesota Power & Light	12	July	4,281,818	3,703,732	2.16	1.82
New York State Electric & Gas	12	July	11,102,408	10,160,671	2.85(g)	2.82(g)
Oklahoma Gas & Electric	12	July	9,111,874	7,827,925	2.36(h)	2.18(h)
Pacific Gas & Electric	12	June	74,655,860	68,655,462	3.51	3.32
Pennsylvania Power & Light	12	June	23,821,608	21,766,761	3.38	3.04
Portland General Electric	12	July	5,010,803	4,849,055	1.67	1.62
Potomac Electric Power	12	June	9,152,080	6,865,858	1.48(i)	1.14(i)
Public Service of Colorado	12	June	10,040,382	8,625,169	2.83	2.37
Public Service of New Hampshire	12	July	4,196,923	4,141,799	1.22(a)	1.37(a)
San Diego Gas & Electric	12	June	6,971,065	4,993,516	1.51(a)	1.06(a)
South Carolina Electric & Gas	12	June	5,353,652	5,026,844	1.40(a)	1.37(a)
Southern Co, consolidated	12	July	28,704,937	24,735,888	1.46(j)	1.36(j)
Southern Indiana Gas & Electric	12	July	2,347,820	2,550,870	1.94(k)	2.34(k)
Tampa Electric	12	July	3,671,667	3,343,624	1.49(l)	1.50(l)
Utah Power & Light	12	July	7,536,787	6,556,365	3.39	3.21

Notes—(a) Based on average shares; (b) Based on 4,830,000 shares in 1956 and 4,600,000 shares in 1955; (c) Based on 896,412 shares; (f) Based on 9,050,145 shares in 1956 and 8,393,346 shares in 1955; (g) Based on 3,337,475 shares in 1956 and 3,034,068 shares in 1955; (h) Based on 3,283,262 shares in 1956 and 2,984,783 shares in 1955; (i) Based on 5,628,700 shares in 1956 and 5,910,135 shares in 1955; (j) Based on 19,594,946 shares in 1956 and 18,087,643 shares in 1955; (k) Based on 996,363 shares in 1956 and 913,333 shares in 1955, and (l) Based on 2,172,855 shares in 1956 and 1,975,323 shares in 1955.

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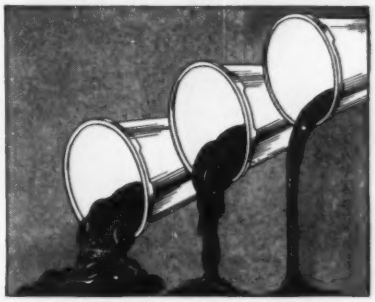

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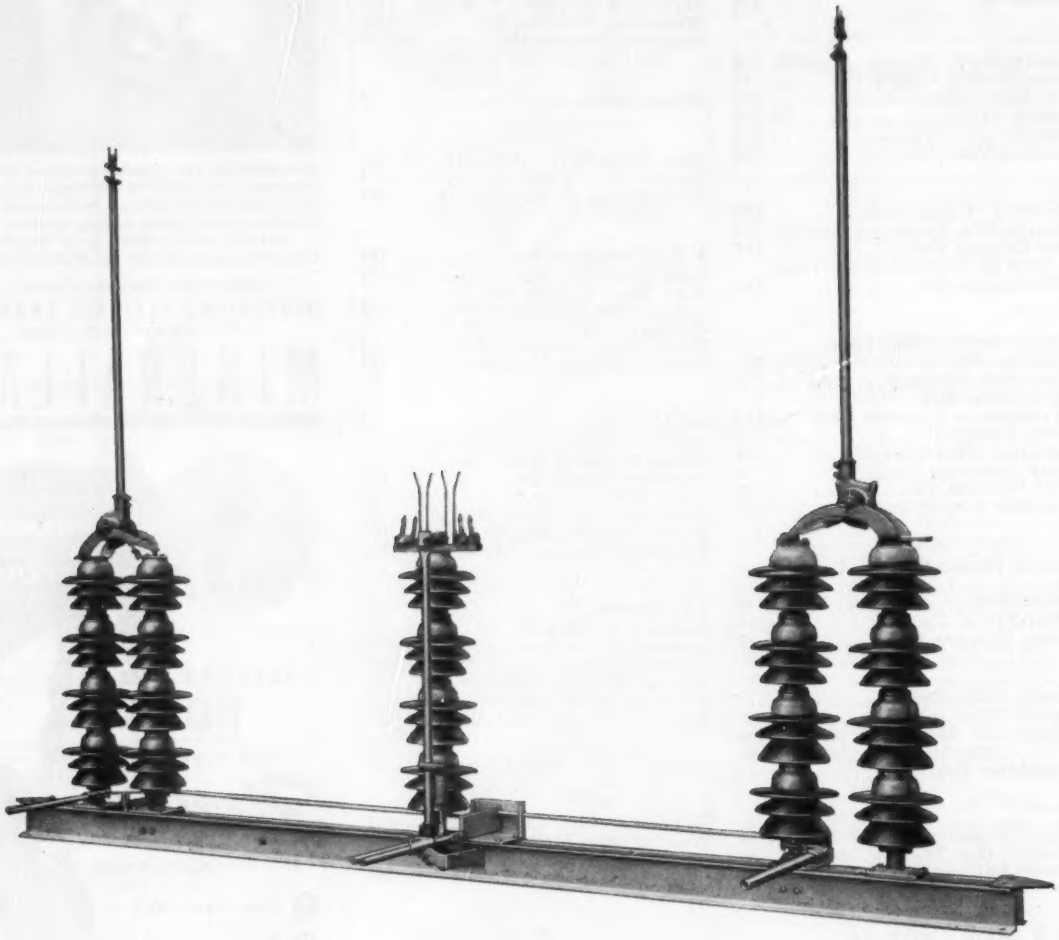

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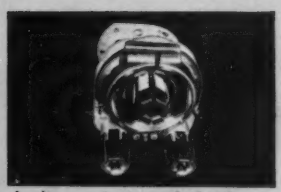

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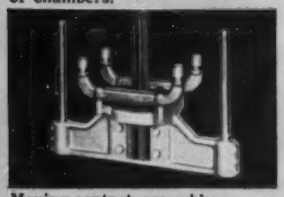

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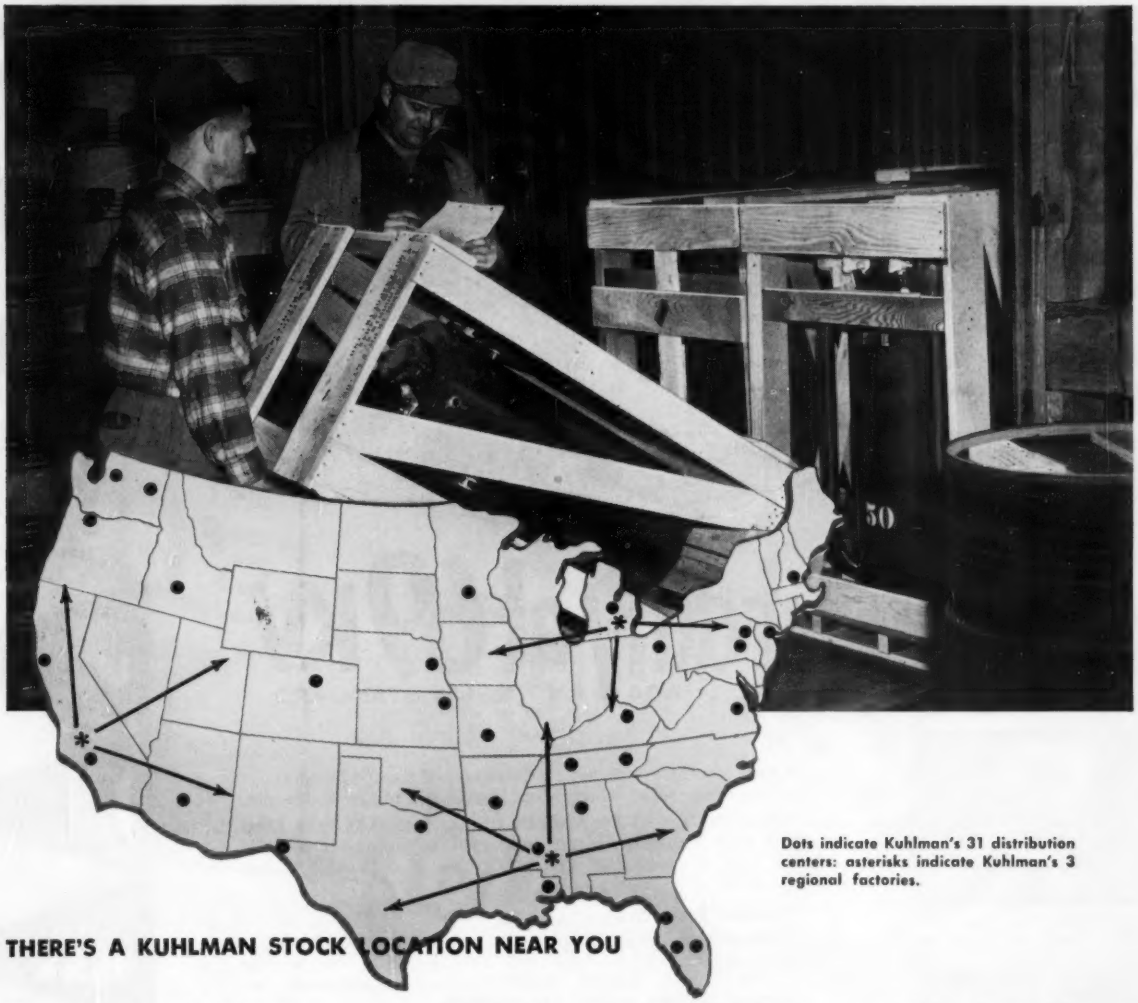

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